REPORT RESUMES

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NATIONAL CONFERENCE OF THE USES OF EDUCATIONAL MEDIA IN THE TEACHING OF MUSIC.
BY- MALTZMAN, EDWARD
MUSIC EDUCATORS NATIONAL CONFERENCE, WASH., D.C.
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A 5-DAY CONFERENCE HELD IN DECEMBER 1964 PROVIDED A FORUM FOR MUSIC EDUCATORS FROM ALL SECTIONS OF THE COUNTRY TO DISCUSS THE USES, IMPLICATIONS, AND POTENTIALS OF NEW DEVELOPMENTS IN EDUCATIONAL MEDIA AND TECHNOLOGY IN MUSIC EDUCATION. DR. R. BUCKMINSTER FULLER PRESENTED THE KEYNOTE SPEECH. EDUCATIONAL MEDIA WERE DISCUSSED BY COMMITTEES COVERING (1) INSTRUMENTAL MUSIC, (2) CHORAL MUSIC, (3) MUSIC THEORY, (4) MUSIC LITERATURE, AND (5) GENERAL MUSIC. DISCUSSIONS OF MEDIA WERE DIVIDED INTO (1) FILMS AND TELEVISION, (2) AUDIO DIVICES, (3) TEACHING MACHINES AND PROGRAMED INSTRUCTION, (4) ELECTRONIC DEVICES AND INSTRUCTIONAL SYSTEMS, AND (5) PRINTED MATERIALS. RECOMMENDATIONS WERE PROVIDED FOR IMPROVEMENT AND EXPANSION OF THE USES OF THE SEVERAL MEDIA FOR MORE EFFECTIVE TEACHING OF MUSIC. (JM)

U. S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
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NATIONAL CONFERENCE ON THE USES
OF EDUCATIONAL MEDIA
IN THE TEACHING OF MUSIC

- Final Report -

Submitted to the
U. S. Office of Education
in fulfillment of Contract No. OE-4-16-021

April 1965

Edward Maltzman
Project Director

Music Educators National Conference
Washington, D. C.

ED003168

Acknowledgments

A Conference of the scope of the National Conference on the Uses of Educational Media in the Teaching of Music could not have been put together without the cooperation and assistance of many people from many quarters. At each step in the organization and progress of the Conference, it was the Director's good fortune to find people whose interest in developing the most stimulating Conference possible equalled his own, and who gave unselfishly of their time and talents toward that goal.

The Director wishes to thank the various commercial firms who generously loaned those items of media requested for use at the Conference, and their local representatives who were extremely helpful in facilitating all the necessary matters with respect to shipping, to furnishing demonstration materials, to instruction and assistance in the operation of the various devices; to the National Audio Visual Association (NAVA) and the National Association of Music Manufacturers (NAMM) for informing their memberships of the Conference and for assistance in contacting specific firms and in locating specific items of media.

Appreciation and thanks are expressed to Mr. M. Robert Rogers and Dr. Howard Mitchell, manager and conductor of the National Symphony Orchestra for inviting the Conference participants to attend the concert on December 9, and for providing recorded materials for demonstration programs; and to Mr. Daniel McCarter of WETA-TV for his special scheduling of the "Fuller World."

Special thanks are due to the National Education Association for its many services and facilities made available for the Conference. In particular, the Director wishes to thank Dr. Anna Hyer, Director of the Department of Audio-Visual Instruction, for her assistance in connection with developing the Consultants for the Conference.

To the Consultants, Dr. Philip Lewis, Dr. Raymond Wyman, Dr. Israel Goldiamond, Dr. Harold Weiner, Dr. C. Ray Carpenter, Dr. Robert E. Slaughter, and Dr. Stanley Pliskoff; and to the Keynote Speaker, Dr. R. Buckminster Fuller, the Director conveys his deepest thanks and gratitude, for responding so graciously to his urgent call and for performing so magnificently in what for them was a strange and unfamiliar (so they claim) field. How much of the success of the Conference was due to their contribution is made manifestly clear in the reports of the Conference Recorders.

Special thanks are due also to Dr. Robert Wagner, Ohio State University, and his staff, for their skillful work and patience in making the music research film shown at the Conference.

To Dr. Harold Arberg, Music Specialist at the Office of Education, for his wise counsel and continuous help in so many ways, to Dr. Thomas Clemens and Dr. Hugh McKeegan, for their patience and help in working out innumerable contractual matters, and to Miss Kathryn Bloom, Director, Arts and Humanities Branch, Office of Education, for her generous support, the Director conveys his deep gratitude.

Very real thanks are due also to Miss Vanett Lawler for her constant encouragement, and to her staff for their invaluable assistance.

Finally, for their devotion and hard work, the Director offers a special "thank you," to his assistant, Miss Adrianne Weir, and his secretary for three months, Miss Marietta Pedersen.

Edward Maltzman
Conference Director

ABOUT THE CONFERENCE . . .

The various educational media have been used for some period of time in the teaching of music. However, their full potentials have not been probed in depth heretofore, nor has there been an exchange of information and findings among users of all media to the degree necessary to make for their optimum use. In addition, specialists in particular media and in the teaching-learning process have not been invited to turn their full attention to the possible uses of all the media in the more effective teaching of music at all levels.

From the standpoint of national needs and concerns, interest in the arts and humanities has never been greater than at this time. The existence of such national interest, coupled with the technological revolution through which we are passing, brings its own imperative for the thoughtful consideration and action of music educators.

For all of these reasons, the time appeared especially ripe for a truly national conference on the uses of educational media in music education. Such a conference, to be successful, would have to accomplish two broad aims. First, it would have to assess the progress made to date in the uses of the principal educational media in music education. And secondly, it would have to point out needs for additional applications in research, development, and use of the educational media in music education.

This was the rationale behind the organization of this National Conference on the Uses of Educational Media in the Teaching of Music. The U. S. Office of Education is pleased to support this conference under the provisions of Title VII of the National Defense Education Act, the Educational Media Program. The Office is particularly pleased to have entered into a contract with the Music Educators National Conference for the conduct of this conference.

Harold Arberg
Music Education Specialist
U. S. Office of Education

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1. INTRODUCTION

1.1. Purposes

The National Conference on the Uses of Educational Media in the Teaching of Music was designed to provide a forum in which music educators from all sections of the country, and from all areas of music instruction and administration could meet for five days to discuss, to exchange ideas, and to probe in depth the uses, implications and potentials of new developments in educational media and technology in music education.

As defined in the contract, the major purposes of the Conference were four in number:

a. to give the conferees an overview of newer developments in educational media and technology;

b. to assess the current status of the uses of educational media in the teaching of music;

c. to identify problem areas of music instruction that have not yet been attacked through the use of educational media; and

d. to develop recommendations for the improvement and expansion of the uses of the several media for the more effective teaching of music, with particular emphasis given to next steps in the kinds of research, demonstration, dissemination and teacher training activities as appear necessary to increase the understanding and use of media in music education.

1.2. Media Categories

Educational media were divided into five major categories: Films and Television, Audio Devices, Teaching Machines and Programed Instruction, Electronic Devices and Instructional Systems, and Printed Materials.

1.3. Components of the Conference

The Conference comprised the following components:

a. Keynote Speech;

b. position papers in each of the media categories by respective media experts who also acted as Consultants to the conferees;

c. demonstrations of representative items from the five media categories;

d. round-table discussions by conferees and Consultants;

e. sessions to summarize the current status and potential use of media in music education as reflected in Conference papers and discussions, and to develop suggestions for future steps in research, teacher training, demonstration and dissemination activities to increase the understanding and use of media in music instruction;

f. a film documenting the work of Dr. Charles Spohn at the Ohio State University, and of Dr. Edward Maltzman at Harvard University, as two instances of the use of new media and technology in music research and instruction.

1.4. Participants; Method of Selection

Participants to the Conference were drawn from every state in the Union: one representative from each state music education association affiliated with the MENC, and the music supervisors from each of the states having such a post.

State association participants were selected in the following manner: letters were sent to the presidents of the state organizations, informing them of the Conference, and requesting them to submit names of individuals from two or three music instruction levels (elementary, secondary, college) and areas (choral, instrumental, theory, etc.). Participants were then selected from among the names submitted, by a Delegate Selection Committee composed of Paul Van Bodegraven, Vanett Lawler, Alex Zimmerman, Charles Gary, Gene Morlan, Harold Arberg, and Edward Maltzman. Participants were selected from among all the levels and areas of music education.

Dr. Frank Churchley, Head of the Department of Music, McGill University, requested, and was invited to attend as the representative of the Canadian Music Educators Association.

1.5. Consultants; Method of Selection

The contract specified the appointment of experts to write positional papers for each media area (these, to be sent for reading by participants before the Conference), and to consult with the participants in the discussion sessions.

When the question of Consultants came up, Dr. Arberg and the Conference Director were aware that there were a number of individuals within the field of music who were well-versed in media, and who also had first-hand knowledge of music instruction problems. The work and worth of these people were well-known to us, and there was no doubt that they would have fulfilled admirably the Consultant roles.

However, there were other considerations to be taken into account. Two of these require explanation. In the first instance, it was realized that a good deal of specialized knowledge and skills (including educational and psychological theory, and hardware) were involved in a thorough understanding of media; consider the specialized aspects inherent in television and programed learning, as examples. Coupled to this, of course, was the fact that with the many developments occurring in media from a number of learning areas, it seemed unlikely that anyone working primarily in music would be able to keep himself up-to-date. Audio-visual and media people reported that they had difficulty keeping abreast of developments.

In the second instance, it was felt that by bringing people who knew the content of music together with specialists with broad experience in theory and application, the Conference would be structured along media lines, and a kind of educational "cross-fertilization" would be effected which might lend added significance to the work of the Conference.

That the step taken was justified is evident in the reports contained herein.

Consultants were as follows:

Dr. C. Ray Carpenter, Director, University Division of Instructional Services, Pennsylvania State University, in the area of Films and Television;

Dr. Israel Goldiamond, Executive Director of the Institute for Behavioral Research; Dr. Stanley Pliskoff, Director, Brain Studies Laboratory, University of Maryland; and Dr. Harold Weiner, Director, Operant Conditioning and Psychophysics Laboratories, St. Elizabeth's Hospital, Washington, D. C.; in the area of Teaching Machines and Programed Instruction;

Dr. Philip Lewis, Director, Bureau of Research, Development and Special Projects, Chicago Public Schools, in the area of Electronic Devices and Specialized Systems;

Dr. Robert Slaughter, Senior Vice President and Director, McGraw-Hill Book Company, Incorporated, in the area of Printed Materials; and

Dr. Raymond Wyman, Professor, School of Education, University of Massachusetts, in the area of Audio Devices.

1.6. Conference Structure

The structure of the Conference was developed at a Planning Session attended by Vanett Lawler, Alex Zimmerman, Edward Cleino, Charles Gary, Philip Lewis, Israel Goldiamond, Stanley Pliskoff, Arthur Reardon, Max U. Bildersee, Harold Arberg, and Edward Maltzman.

For a workable discussion-exploration format, it was decided to divide music education into five general instructional areas, namely choral, instrumental, theory, literature, and general music; and to group participants into Task Force Groups corresponding to each area, in accordance with the expressed preferences of the participants.

Each Task Force Group would then meet as a unit with a Consultant in each media category, and thus be able to explore their individual instructional areas along all the media dimensions. The Task Force Group sessions were interspersed with General Sessions, the content of which was determined by the Director and his planning group.

The Field Trip to the Institute for Behavioral Research evolved in this Planning Session. Planning members were intrigued with Dr. Goldiamond's references to the work going on there, and suggested that such a trip would be a valuable experience for the participants.

The Planning Session also suggested the appointment of a Conference Summarizer-Moderator. Dr. Robert Choate, Boston University, agreed to fill this post.

1.7. Recorders

When the Delegate Selection Committee met to do its work, the Planning Session had already been held. At the Selection Committee meeting, the Director outlined the structure and format of the Conference. It was then realized that with all five Task Force Groups holding sessions simultaneously, it would be impossible for the Director or anyone else to attend all of these. Hence, the problem existed as to how to obtain reports from each of the Task Force Group sessions, in which the major work of the Conference would be conducted. The Delegate Selection Committee suggested inviting five prominent music educators to act as Recorders, one for each Task Force Group. Each of the educators suggested for this purpose, on being apprised of the Conference, graciously accepted the appointments. The recorders were:

Dr. Frances Andrews, Professor of Music, Pennsylvania State University;

Mrs. Oleta Benn, Professor of Music, Carnegie Institute of Technology;

Dr. Charles Leonhard, Professor of Music, University of Illinois;

Dr. Thurber Madison, Professor of Music, Indiana University; and

Dr. Roger Phelps, Professor of Music, New York University.

1.8. Keynote Speaker

The name and work of R. Buckminster Fuller are too well-known to require elucidation here. When Dr. Chester Neudling, Humanities Specialist at the U. S. Office of Education, suggested Dr. Fuller as the best possible Keynote Speaker he could think of to spark the kind of Conference we envisioned, his suggestion was seized upon immediately by Dr. Arberg, Miss Bloom and the Conference Director. Negotiations with Dr. Fuller were conducted through his secretary, Miss Naoma Smith, since at that time, he was enroute to Russia as a member of the American-Russian Cultural Exchange Meeting held in Leningrad. All concerned with the Conference were immensely pleased when word came from Miss Smith that Dr. Fuller had accepted the invitation, and that he would meet with the Director on his return to this country. The subsequent meetings with Dr. Fuller were memorable experiences for the Director.

In order to permit Conference delegates and participants to personally meet, and to get to know more about Dr. Fuller, a reception in his honor, as well as a viewing of one of the National-Educational-Television-produced "The Fuller World" programs, were arranged. Mr. Daniel McCarter, manager of the Washington ETV station, WETA-TV, graciously scheduled the program over his station so that the Conference participants could view it during the General Session held at the Demonstration Center of the U. S. Office of Education.

1.9. The Conference Program

As the Conference developed and took form, Dr. Charles Spohn, whose work was to be shown via film, was invited as a Research Consultant, to answer questions arising from the film; Mr. Stanley Foster Reed, president of the Reed Institute for Creative Studies, and a close friend of Dr. Fuller's, was invited as a Resource Consultant to chair the General Session in which the Sebastian De Grazia film, "Of Time, Work and Leisure," was shown; Dr. G. M. Torkelson, who, while Coordinator of Media Research at the Office of Education, worked with Dr. Arberg in developing the Conference, was invited as a Resource Consultant to chair the General Session in which the film, "Automated Rhythm Training; and Aural Perception Training," was shown and Drs. James Carlsen and Walter Ihrke of the University of Connecticut were invited to answer questions on their work arising from the film.

Dr. Edward Cleino, as the newly-appointed chairman of the MENC Audio-Visual Committee, was invited as an Observer. Mr. Reardon, who had attended the Planning Session, later expressed an interest in making a media attitude evaluation. Mr. Reardon also worked with the Director in developing a form for evaluating certain aspects of the Conference for the benefit of the Conference planners.

Following is the Conference program:

NATIONAL CONFERENCE ON THE USES OF EDUCATIONAL MEDIA IN THE TEACHING OF MUSIC

Sponsored by the
Music Educators National Conference
and the
United States Office of Education

December 7 - 11, 1964

National Education Association Center
1201 Sixteenth St., N.W., Washington, D.C. 20036

UNITED STATES OFFICE OF EDUCATION

Mr. Francis Keppel, Commissioner

Miss Kathryn Bloom, Director, Arts and Humanities Branch

Dr. Harold Arberg, Music Specialist, Arts and Humanities Branch

MUSIC EDUCATORS NATIONAL CONFERENCE

Dr. Paul Van Bodegraven, President

Miss Vanett Lawler, Executive Secretary

Dr. Charles Gary, Associate Executive Secretary

Dr. Edward H. Cleino, Chairman, Audio Visual Committee

CONFERENCE DIRECTOR

Dr. Edward Maltzman

KEYNOTE SPEAKER

Dr. R. Buckminster Fuller, Professor of Design, Southern Illinois University

CONSULTANTS

Dr. C. Ray Carpenter, Director, University Division of Instructional Services, Pennsylvania State University (Visiting Professor of Psychology, University of North Carolina); *Films and Television*

Dr. Israel Goldiamond, Professor of Psychology, Arizona State University; Executive Director of the Institute for Behavioral Research; and Dr. Harold Weiner, Director, Operant Conditioning and Psychophysics Laboratories, Saint Elizabeth's Hospital, Washington, D. C.; *Teaching Machines and Programed Instruction*

Dr. Philip Lewis, Director, Bureau of Research, Development and Special Projects, Chicago Public Schools; *Electronic Devices and Instructional Systems*

Dr. Robert Slaughter, Senior Vice President and Director, McGraw-Hill Book Company, Incorporated; *Printed Materials*

Dr. Raymond Wyman, Professor, School of Education, University of Massachusetts; *Audio Devices*

PANEL MODERATOR

Dr. Robert Choate, Professor of Music, School of Fine and Applied Arts, Boston University

EVALUATION

Mr. Arthur W. Reardon, Director, Instructional Materials Center, Plainfield (New Jersey) Public Schools

RESOURCE CONSULTANTS

Dr. Charles L. Spohn, Associate Professor of Music, Ohio State University

Dr. G. M. Torkelson, Professor of Education, Pennsylvania State University

Dr. Stanley S. Pliskoff, Director, Brain Studies Laboratory, University of Maryland

Mr. Stanley Foster Reed, Director, Reed Research Institute for Creative Studies

TASK FORCE GROUPS

TFG 1.—Instrumental

Mr. Everett Gates, New York State School Music Association (Chairman)
Mr. Carl Barnett, Oklahoma Music Educators Association
Mr. Alfred Bleckschmidt, Supervisor, Fine Arts Education, Missouri
Mr. Robert Q. Crebo, State Supervisor of Music, Montana
Dr. Frank Crockett, Music Consultant, Georgia
Mr. LeRoy Esau, Kansas Music Educators Association
Mr. Paul S. Flinn, Pennsylvania Music Educators Association
Mr. Duane A. Fuller, Nevada Music Educators Association
Mr. Clarence I. Hegg, Minnesota Music Educators Association
Mr. Jesse Joiner, Alabama Music Educators Association
Mrs. Marjorie Keller, Texas Music Educators Association
Mr. Ashford Kelley, Alaska Music Educators Association
Mr. G. Lloyd Schultz, State Music Supervisor, Wisconsin
Mrs. Elizabeth White, Michigan Music Educators Association

Recorder: Dr. Frances Andrews, Professor of Music, Pennsylvania State University

TFG 2.—Choral

Dr. Richard C. Berg, Missouri Music Educators Association (Chairman)
Mrs. Naoma Aiwohi, Hawaii Music Educators Association
Dr. John M. Batcheller, New Mexico Music Educators Association
Miss Dorothy Bridenthal, Arkansas Music Educators Association
Mr. Alexis Cote, Maine Music Educators Association
Miss Betty S. Duvall, Mississippi Music Educators Association
Mrs. Bessie Hand-Browning, Kentucky Music Educators Association
Mr. Charles W. Jones, California Music Educators Association
Mr. Elton Lamkin, State Supervisor of Music, Louisiana
Mr. Don L. Marketto, Indiana Music Educators Association
Mr. Donald Robinson, Georgia Music Educators Association
Dr. Joseph G. Saetveit, Supervisor of Music Education, New York
Dr. Raymond O. Thigpen, Music Supervisor, South Carolina
Mr. Raymond Trenholm, Nebraska Music Educators Association
Mr. Emerson S. Van Cleave, Music Education Consultant, Alabama

Recorder: Mrs. Oleta Benn, Professor of Music, Carnegie Institute of Technology

TFG 3.—Music Theory

Mr. Reid Poole, Florida Music Educators Association (Chairman)
Mr. Earl Beach, North Carolina Music Conference
Dr. Frank E. Churchley, Canadian Music Educators Association
Dr. Gerald W. Erwin, Supervisor in Music Education, Hawaii
Mr. William L. Johnston, State Supervisor of Music, Illinois
Dr. V. J. Kennedy, State Music Supervisor, Texas
Dr. Frank Liddel, Vermont Music Educators Association
Dr. William M. McQueen, Supervisor Music Education, Kentucky
Dr. Robert Noble, Wyoming Music Educators Association
Mr. Charles L. Reifsnyder, New Jersey Music Educators Association
Miss Dorothea Schaer, Oregon Music Educators Association
Mr. Harold Schiff, Delaware Music Educators Association
Mr. Loran Stephenson, District of Columbia Music Educators Association
Mr. Loy Wagner, South Carolina Music Educators Association

Recorder: Dr. Charles Leonhard, Professor of Music, University of Illinois

TFG 4.—Music Literature

Dr. Louise M. Alton, Louisiana Music Educators Association (Chairman)
Dr. Alice A. D. Baumgarner, Supervisor of Music Education, New Hampshire
Miss Ernestine L. Ferrell, Supervisor of Music Education, Mississippi
Mr. James Fisher, Maryland Music Educators Association
Dr. Russell P. Getz, Coordinator of the Arts, Pennsylvania
Mr. Floyd T. Hart, State Music Supervisor, Delaware
Mrs. Helen B. Kilduff, Connecticut Music Educators Association
Dr. Paul Lehman, Colorado Music Educators Association
Mr. James B. Mitchell, Massachusetts Music Educators Association
Mr. Paul S. Rice, North Dakota Music Educators Association
Mrs. Monica Rogers, Illinois Music Educators Association
Mr. Edmund Sedivy, Montana Music Educators Association
Dr. Donald J. Shetler, Ohio Music Education Association
Mrs. Janice S. Smith, Iowa Music Educators Association
Mr. Henry J. Von der Heide, Idaho Music Educators Association

Recorder: Dr. Thurber Madison, Professor of Music, Indiana University

TFG 5.—General Music

Dr. Bernard W. Busse, Virginia Music Educators Association (Chairman)
Mr. George W. Black, New Hampshire Music Educators Association
Mr. Clifford Brown, West Virginia Music Educators Association
Dr. Marjorie M. Coakley, State Supervisor of Music, Ohio
Dr. O. M. Hartsell, Arizona Music Educators Association
Dr. C. J. Hesch, Educational Program State Supervisor-Music, Virginia
Mr. T. Earl Hinton, Tennessee Music Educators Association
Mr. Arnold Hoffmann, State Supervisor of Music, North Carolina
Mrs. Phyllis Hoiseth, South Dakota Music Educators Association
Miss Adeline Mantino, Rhode Island Music Educators Association
Mrs. Margaret C. Richards, Utah Music Educators Association
Mr. Emmett R. Sarig, Wisconsin Music Educators Conference
Mr. Jack E. Schaeffer, Washington Music Educators Association
Dr. J. Richard Warren, Consultant in Music Education, Florida

Recorder: Dr. Roger Phelps, Professor of Music, New York University

SUNDAY, DECEMBER 6

7:00 PM - 9:00 PM Registration
Upper Lobby, Statler-Hilton

8:00 PM Director's Meeting
Michigan Room, Statler-Hilton

Task Force Group Chairmen, Recorders, Consultants, and Panel Moderator—Purposes and Procedures of the Conference

MONDAY, DECEMBER 7

9:00 AM Registration *Allan Room, NEA Center*

10:15 AM Welcoming Remarks *Auditorium, NEA Center*

Dr. Paul Van Bodegraven,
President, MENC

Dr. Harold Arberg, Music Specialist, Arts and Humanities Branch, U. S. Office of Education

Keynote Speech

Dr. R. Buckminster Fuller

Introduced by Dr. Edward Maltzman

12:00 Noon Lunch Break

1:30 PM Orientation Session *Auditorium, NEA Center*

Dr. Edward Maltzman, Dr. Harold Arberg

Introduction of Media Consultants

2:30 PM - 4:30 PM Task Force Groups (TFG)

SESSION I .... NEA Center

TFG 1.1. .... Room 104
Consultant: Dr. Harold Weiner

TFG 2.1. .... Horace Mann, Room A
Consultant: Dr. Raymond Wyman

TFG 3.1. .... Room 106
Consultant: Dr. Robert Slaughter

TFG 4.1. .... Horace Mann, Room B
Consultant: Dr. C. Ray Carpenter

TFG 5.1. .... Auditorium
Consultant: Dr. Philip Lewis

4:30 PM - 6:00 PM Reception *Board Room, NEA Center*

In honor of Dr. R. Buckminster Fuller

Dinner—Evening Free

8:30 PM Special Meeting *Allan Room, NEA Center*

Council of State Music Supervisors

TUESDAY, DECEMBER 8

TFGs 1,2,3. SECTION I

8:30 AM Field Trip *Meet outside Statler-Hilton for bus trip*

Institute for Behavioral Research—
Dr. Israel Goldiamond

12:00 Noon Lunch Break

2:00 PM Task Force Groups

SESSION II .... NEA Center

TFG 1.2. .... Auditorium
Consultant: Dr. Philip Lewis

TFG 2.2. .... Room 104
Consultant: Dr. Harold Weiner

TFG 3.2. .... Horace Mann, Room A
Consultant: Dr. Raymond Wyman

TFGs 4,5. SECTION II

9:00 AM Task Force Groups

SESSION II .... NEA Center

TFG 4.2. .... Room 106
Consultant: Dr. Robert Slaughter

TFG 5.2. .... Horace Mann, Room
Consultant: Dr. C. Ray Carpenter

11:00 AM Lunch Break

12:30 PM Field Trip *Meet in NEA Lobby for bus trip*

Institute for Behavioral Research—
Dr. Israel Goldiamond

SECTIONS I and II

4:00 PM - 5:00 PM General Session
Auditorium, NEA Center

Dr. Harold Weiner, Chairman
"Learning and Behavior (The Teaching Machine)" CBS Conquest Film Series

Dinner Break

8:30 PM Open Session — Panel Discussion
Board Room, NEA Center

Panel Moderator: Dr. Robert Choate

Panelists: Consultants and Selected Delegates. (Delegates may ask questions of consultants and consultants may ask questions of the delegates)

WEDNESDAY, DECEMBER 9

8:30 AM General Session
Meet outside Statler-Hilton for bus trip to: Demonstration Center, U. S. Office of Education

Dr. Harold Arberg, Chairman

Welcome to Conference Delegates from Mr. Francis Keppel, U. S. Commissioner of Education

"The Fuller World"—NET Production

Demonstrations

Film—"Self-Teaching of Music Fundamentals" Dr. Charles Spohn, Ohio State University; "Analysis of Musical Behavior" Dr. Edward Maltzman, Harvard University

Discussion Period

12:00 Noon Lunch Break

2:00 PM Task Force Groups

SESSION III .... **NEA Center**

TFG 1.3. .... *Horace Mann, Room B*
Consultant: Dr. C. Ray Carpenter

TFG 2.3. .... *Auditorium*
Consultant: Dr. Philip Lewis

TFG 3.3. .... *Room 104*
Consultant: Dr. Harold Weiner

TFG 4.3. .... *Horace Mann, Room A*
Consultant: Dr. Raymond Wyman

TFG 5.3. .... *Room 106*
Consultant: Dr. Robert Slaughter

4:30 PM - 5:30 PM General Session
Auditorium, NEA Center

Mr. Stanley Foster Reed, Chairman

Film—"Of Time, Work and Leisure" (NET)

Dinner Break

8:00 PM Concert
Constitution Hall, 18th and D Streets, N.W.

National Symphony Orchestra

THURSDAY, DECEMBER 10

8:30 AM Task Force Groups

SESSION IV .... **NEA Center**

TFG 1.4. .... *Room 106*
Consultant: Dr. Robert Slaughter

TFG 2.4. .... *Horace Mann, Room B*
Consultant: Dr. C. Ray Carpenter

TFG 3.4. .... *Auditorium*
Consultant: Dr. Philip Lewis

TFG 4.4. .... *Room 104*
Consultant: Dr. Stanley Pliskoff

TFG 5.4. .... *Horace Mann, Room A*
Consultant: Dr. Raymond Wyman

11:00 AM General Session *Board Room, NEA Center*

Dr. G. M. Torkelson, Chairman

Film—"Automated Rhythm Training" Dr. Walter Ihrke, University of Connecticut; "Aural Perception Training" Dr. James Carlsen, University of Connecticut

12:00 Noon Lunch Break

2:00 PM **Task Force Groups**

SESSION V .... **NEA Center**

TFG 1.5. .... *Horace Mann, Room A*
Consultant: Dr. Raymond Wyman

TFG 2.5. .... *Room 106*
Consultant: Dr. Robert Slaughter

TFG 3.5. .... *Horace Mann, Room B*
Consultant: Dr. C. Ray Carpenter

TFG 4.5. .... *Auditorium*
Consultant: Dr. Philip Lewis

TFG 5.5. .... *Room 104*
Consultant: Dr. Stanley Pliskoff

4:30 PM -5:30 PM **General Session**
Board Room, NEA Center

Dr. Robert Choate, Chairman
Preliminary Report Statements

Dinner Break

8:00 PM **Recorders, TFG Chairmen:**
Report Preparation

Conference Delegates:
Special Session

English Language Services
1708 H Street, N.W.

FRIDAY, DECEMBER 11

8:30 AM **Task Force Groups**

REPORT PREPARATION .... **NEA Center**

TFG 1 .... *Horace Mann, Room A*

TFG 2 .... *Room 106*

TFG 3 .... *Horace Mann, Room B*

TFG 4 .... *Auditorium*

TFG 5 .... *Room 104*

12:30 PM **Conference Luncheon** *Board Room, NEA Center*

Impressionistic Synthesis—
Panel Discussion
Dr. Robert Choate, Chairman

2. POSITIONAL PAPERS

2.1. Music Education and the Rationale Underlying Programmed Instruction

Israel Goldiamond and Stanley Pliskoff*

Practically every child learns how to ride a bicycle. Turning the pedals has the consequence of moving him forward; the rate of this consequence is usually directly proportional to the rate of his behavior. As he starts to fall, turning the wheel in the direction of the fall will have the consequence of breaking the fall, but another consequence is that he will no longer be moving forward. Eventually, these differing consequences come into functional relation not only with very refined behaviors, but with subtle discriminations which are established for differing conditions of the road, wind, bicycle, the rider's posture, and like. These behavioral and discriminative skills become automatic and immediately sensitive to the differing consequences they produce, and which govern them in turn. The invariate relations between consequences and behaviors are such that not only do children almost invariably learn to ride bicycles, but circus animals, such as bears and chimpanzees, are also taught this behavior.

Much of the experimental analysis of behavior has been focussed on those behaviors which are modified or maintained by the consequences they produce. Such behavior, whose rate or form is so governed by its consequences, is called operant behavior (Holland and Skinner, 1961; Skinner, 1953). In the laboratory, the relationship between operant behavior and its consequences has been made explicit, and has been put under experimenter control. The consequences which normally maintain a specified operant behavior may be presented upon the occurrence of the behavior, they may be withheld, or they may be scheduled in other manners. Other stimuli may be presented or withdrawn, in whose presence a specified behavior will produce certain consequences. The maintaining property of certain consequences has been extended to novel ones which hitherto had not had such an effect. Under these carefully controlled conditions, there is developing a growing body of knowledge concerning the relationship of behavior to its consequences, and to other features of the environment; in the pursuit of such knowledge, there is also being developed a growing body of procedures which can be utilized not only in the laboratory, but can be extended from it to human problem behaviors outside (cf. Ayllon and Azrin, 1964), for the purpose of establishing new behavior, and modifying, maintaining, and attenuating other behaviors. There is being developed a growing technology of behavior in the full sense of the word, technology, which is related to the experimental analysis of behavior in the same sense that the technology called engineering is related to the physical sciences.

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Both the technology and its concomitant experimental analysis are relevant to the teaching of music for a variety of reasons; the major ones are presented (cf. Sidman, 1960):

1. The behaviors involved in music are operants. The child plays a key on the piano or moves a bow across strings,

and the consequence may be a sound. The teacher may attach yet other consequences when one sound rather than another is produced. He may say, "Good," or "Let's try again," or beam, or wince. He would like to have the child develop an ear for music, so that he can correct himself. Stated otherwise, he would like the consequences (sounds) that the child produces to affect the child the same way that those sounds affect him (another set of consequences), so that the child's musical behaviors are altered or maintained.

Accordingly, a technology whose subject matter is a systematization of the maintenance and modification of behavior by its consequences may be relevant to the practice of teaching music.

2. Alteration of behavior is a means of developing procedures for training. The skilled music teacher often discovers that certain procedures are useful with a particular child. He **discovers** this by their success or failure with the child. Stated otherwise, the child's changing behavior guides the teacher in analyzing what he would do; it develops his teaching skills, that is, it changes his teaching behaviors.

In the experimental analysis of behavior, modification of behavior as the variables are being changed is one of the major investigative tools not only for developing procedures for the alteration of behavior, but for understanding the functional relations between behavior and its environment. Accordingly, an experimental approach which has developed systematic ways of modifying behavior may be relevant for music education, one form of modification of behavior.

3. Alteration of behavior is a means of developing insights into its processes. The child's changing behavior not only guides the teacher in improving his own teaching practice, but may also help him understand the child and the nature of the music learning process.

As was mentioned in the preceding section, such alteration is a prime investigative tool for basic research in the experimental analysis of behavior. Accordingly, such an experimental procedure may be useful in developing systematic ways to understand the music education process in the course of the ordinary practice of teaching music.

4. Learning is an individual process. It is a single child who learns, and it is a truism that a classroom consists of individual learners. A child who fails is not consoled by the fact that the teaching method used is efficacious for the average child, or produces better average performance than another method, or teacher. Nor are his parents so consoled, nor is the conscientious teacher.

Operant research is characterized by the use of single organisms for extended periods of time, and the alteration of behavior of the single organism being studied is one of the prime investigative tools. Stated otherwise, the attempt is to develop lawful procedures and relations which hold using an individual organism. A procedure is evaluated on this basis rather than being evaluated for its effects upon an average, some of whose members learn and some of whose members do not.

Accordingly, an experimental and technological procedure which assays its success by its effects upon the individual may be relevant for music education, which assays its success similarly.

5. Learning may be a long-term process. The child learns over an extended period of time. This truism is important when one considers the fact that much of our research in learning involves studies in which organisms are run for short periods of time.

Operant research involves extended periods of time, and the learning organism is checked against his own behavior at preceding times. It has been observed that changes which occur over a short period of time are often transient, and are not characteristic of the changes that a procedure will produce when applied over an extended period of time. Accordingly, a procedure which incorporates such long term effects in its design may be relevant for the procedures of music education.

6. Learning often involves continual adjustments. The experienced teacher tries, especially with beginners, to provide continual successes. He tries to arrange the material and his relations to the child so that the child is not discouraged by failures, and keeps advancing.

In programmed instruction, an attempt is made to set up a program which starts with the child at his entering level. Through successive steps which require small changes in behavior, and are so arranged that the child is reinforced at every step, his behavior is altered to the terminal behavior required, without failures which might discourage him.

Programmed instruction is, to a considerable extent, related to the experimental analysis of behavior. Accordingly, if it is to be applied to music education, consideration of its rationale may be relevant.

7. Motivation may be defined by observables. The problem of motivating the child is central to any teaching practice. Motivation is often considered a process within the child, whose motivational processes are thus considered difficult to tap.

Operant research defines motivation in observable terms, and suggests procedures for its experimental control. These procedures find use in laboratories where behavior is sustained for extended periods of time, under conditions which allow for considerable freedom. Motivational variables enter into the very definition of the stimulus and response classes being investigated.

Accordingly, a procedure which incorporates motivational variables into the basic definitions of some of its major terms, and deals with them in an observable and manipulable manner, may have relevance for motivational problems in music education.

8. Complex processes are known by their behaviors. Music educators often talk in terms which imply complex higher mental processes. Examples of such terms are insight, creativity, meaningfulness, and appreciation. These processes are considered extremely important in learning music.

One of the characteristics of linguistic analysis, which operant research shares, is its attempt to specify complex processes through the behaviors and conditions by which such processes are identified. The question asked is essentially the following: When we state that a person is engaged in a certain process, say, that he is interested, what is it that he has to do, and under what conditions, for us to state that he is interested? Rather than trying to define interest as an internal process (although there may very well be internal components), we look for the behaviors which define the term for us. Stated formally, the question is: What behaviors under what conditions define the process we are interested in? We can then not only see whether or not we are getting such behavior, but can attempt to program the environment to produce such behaviors as criterion behaviors. If the intervening steps on the program are also specified behaviorally, we can also see how successful we are and alter our training procedures accordingly.

9. The acquisition of knowledge is incorporative. The teacher who develops a new method or new insights tests them out by incorporating them into further practice, or by having others incorporate these procedures or insights.

In the experimental analysis of behavior, the procedures and functional relations developed to alter the behavior of a single organism are then repeated and validated with other single organisms. The functional relations and procedures developed in operant research have been replicated literally thousands of times. That other investigators are able to apply them leads directly to the next point.

10. Communication of knowledge is often simplified by explicitness. The attempt is often made to communicate new

methods and insights developed in music education. The procedures and insights are often difficult to describe, and their validation is also often difficult to assay. One result of this communicative difficulty has been the establishment of special schools or approaches, whereby the new approach is communicated by implicit methods through having the students engage in similar behaviors.

In the experimental analysis of behavior, the procedures for modification and the functional relations obtained are stated explicitly, and can be incorporated by other investigators, and validated by them.

Accordingly, an experimental and technological procedure which can explicitly state its advances so that others can incorporate them or validate them, may be relevant for the incorporation and validation of new techniques and insights gained in music education. Such explicitness is, of course, not restricted to operant research, but is an aim of sceintific communication in general. We shall now consider some of the major findings of operant research as they apply to music education. Needless to say, space considerations will limit us only to a most sketchy account.

The operant paradigm

Operant behavior is defined as behavior whose rate or form is governed by its consequences (Keller and Schoenfeld, 1950). In the laboratory, the arrangements are made explicit. A pigeon pecks at a disc which closes a microswitch which immediately activates a food dispenser. If the schedule is so arranged that ten pecks will be required to activate the dispenser rather than one, the rate of pecking will increase. If the color of the disc is red when one peck produces food, but green when ten pecks activate the dispenser, changing the disc from red to green will after a while instantly produce a sharp increase in rate characteristic of that ratio, and changing to red will produce a decrement. Not only can differential rate be thus established, and brought under the control of environmental cues, but different forms of behavior can also be established and maintained by consequences. If an upward thrust is required to activate the dispenser, that is, downward thrusts do not activate it, but upward thrusts do, and the behavioral requirement is continually shifted upward, the form of behavior will change. It is in this manner that pigeons, who normally peck on the ground, will routinely be converted into woodpeckers in operant laboratories; they stand in a stretched manner, pecking at a disc which is high up.

One could substitute for the disc a score and white and black piano keys, for the forms of the behavior pianissimo and forte strikes on the keyboard, for the rate of the behavior different rhythms, and for the consequences different sounds, and draw a parallel to musical performance.

The basic building blocks of operant research may be characterised as follows:

1. The response.--A response is defined by the experimenter as some behavior which he can repeatedly observe and define. It is usually convenient to have it defined by a switch (a peck at

a disc, a lever, a piano key) for ease in recording; also the switch that records can immediately activate a consequence device (a food dispenser, water, a sound). The response can be so complex that it can only be defined socially, for example, a stutter (Goldiamond, 1964). In this case, the monitor presses a switch. A response may be defined not only by its topography, but also by its consequences. A pigeon pecking at a disc or pecking another bird's eyes out may exhibit two responses which have the same topography, but they are maintained by different consequences, hence are considered as being different operants. Responses which differ in topography, but have similar consequences may be defined as being in the same operant class, for example, reading Braille and reading print.

2. The consequence.--Consequences are of two kinds: reinforcing or aversive. A reinforcing stimulus is defined as (a) a consequence of behavior which (b) maintains the behavior upon which it is contingent. In the case of the pigeon, food reinforces the behavior; and in the case of the piano player, producing sounds on keys may reinforce the behavior. An aversive stimulus is defined as (a) a consequence of behavior (b) whose elimination maintains the behavior which eliminates it. If a rat presses a key which turns off an ongoing shock, such key pressing may be maintained. If a child by creating a disturbance can be sent out from a lesson he does not particularly enjoy, the likelihood of such disturbance is increased. When we reverse these contingencies, the effects tend in the opposite direction. If we make the elimination of an ongoing

reinforcing stimulus contingent upon behavior, that behavior is likely to be attenuated; if we make the presentation of an aversive stimulus contingent upon behavior, that behavior is also likely to be attenuated. Both of these are forms of punishment (Holz and Azrin, 1963). We can also arrange it so that a response which hitherto produced a consequence now no longer produces a consequence. Such cessation of a consequence, that is, having the response do nothing, is called extinction. The use of extinction can attenuate behaviors which have been *maintained* by consequences, or can increase behaviors which had been *attenuated* by their consequences.

2-1. *Relations between consequences and behavior*. As was mentioned earlier, the scheduling of a consequence contingent upon a response is made explicit in the laboratory. In the case of the piano, if we could arrange it so that when the child pressed a key, sound was produced or was not produced in accord with our schedule, we would have a direct parallel to the laboratory situation. In this manner, we might arrange it so that the wrong key produced no sounds, and only the right keys produced sounds. Or we might govern force this way. Or we might have the wrong keys and the right keys produce yet other effects, such as tokens, lights, and so on (Maltzman, 1964).

Effects of different schedules of reinforcement (Ferster and Skinner, 1957) have received considerable attention. In early stages of training, every response produces a consequence. Thereafter, two responses may be required to produce a consequence, that is, pressing the key the first time does nothing, but repeating the response does produce the sound or another consequence. The schedule can be increased, and it has been possible to maintain performance where the pigeon is required to peck 25,000 times for one grain. Such extensive performance for a very small reward could not have been obtained initially, but had to be programmed. It can also be arranged that the consequence will follow behavior only after a fixed period of time has elapsed after the last consequence was made available. Such scheduling produces what can be considered timing behavior. The pigeon responds, the consequence is delivered, and he then waits for a given period of time before responding again. The consequence can also be arranged to occur at random intervals. These differing schedules (of which we have presented only a few examples) produce not only different patterns of behavior, but also produce different patterns of extinction. For example, behavior which is maintained on a variable interval schedule (where the reinforcement occurs at variable times) is very difficult to extinguish. There is a record of a pigeon who pecked 500,000 times without reinforcement before the experimenters gave up. He had been on a variable interval schedule. Observing the behavior of this pigeon who persisted in pecking without getting reinforcements, we might state that this was a persevering pigeon and one who had character.

3. Discriminative stimuli.--These are stimuli in whose presence behavior produces different consequences. Examples are the red and green traffic lights, which control traffic for the very simple reason that different consequences are attached to

driving or not driving in their presence. In the laboratory, if food is presented when a response is made in the presence of a green light, but not in the presence of a red light, after a short while the pigeon will respond when the light turns green, but will go away when it turns red, occasionally glancing over his shoulder to see if the light has turned green again. When the light turns green, the pigeon will instantaneously come back and respond. The color of the lights may be said to be controlling the behavior. Such establishment of differential control over behavior by stimuli is referred to as discrimination (Goldiamond, 1962).

Such procedures are utilized in training children to read. Higher complex sets of stimuli can come to control our behavior because different consequences are attached to behaving in their presence. Examples of such control in children are reading books, notes and the like.

Instructions are discriminative stimuli which maintain control relative to differential consequences attached to obeying and not obeying. Animals can be taught to abstract, that is, respond to novel stimuli which have properties in common with other discriminative stimuli, and research in conceptualization is another outgrowth of this area of investigation.

4. Constant stimuli.--These are stimuli in whose presence the varying behaviors are established. They are not differentially related to reinforcement, like the discriminative stimuli. In the case of the pigeon cited, if a sudden noise were introduced, the behavior might be disturbed, but such disturbance is usually transient if the consequences remain the same.

5. Deprivation variables.--These are procedures for making a given reinforcement effective. For example, to make food an effective reinforcer, we usually deprive the pigeon of food until he is at 80% of normal body weight. Or we can deprive an organism of water, in which case water will be an effective consequence. Sailors returning from a long ocean trip exhibit very strong behaviors toward yet other consequences of which they have been deprived. Social approval and money are other consequences. There are other ways of making reinforcers of stimuli which had hitherto not had such a history in the maintenance of behavior. One of the ways is to present a stimulus together with a reinforcing stimulus, thereby establishing it as a conditioned reinforcer for which an organism will work in the absence of the original reinforcer (Kelleher and Gollub, 1962).

It should be reiterated that these statements are merely an outline of the basic variables involved in operant research, which is a systematic discipline containing far more than can be presented in this limited space. In the following sections, we shall consider certain interrelations between these basic variables which we consider to be particularly relevant to music education.

Differential reinforcement: shaping and fading

It was mentioned earlier that in the establishment of discrimination, for example between a red and green light, reinforcement was made contingent upon behavior in the presence of one of the stimuli, but not in the presence of the other. Such systematic use of differential consequences is known as differential reinforcement, and differential reinforcement may also be used to alter behaviors as well as discriminative stimuli. Differential reinforcement is basic to almost all learning procedures, as was indicated in our introductory statements on riding a bicycle.

Differential reinforcement often involves a considerable number of extinction trials, that is, the organism will not be reinforced for responding to the "wrong" stimulus, or making the "wrong" response. Such nonreinforced behavior can have as its concomitant many emotional behaviors, which are often subsumed under the term "frustration". Frustration has often been regarded as hindering learning. Yet we have indicated in our discussion of differential reinforcement that it seems to be a necessary element of much learning.

Recent developments in the laboratory and in programmed instruction indicate that it is possible to establish highly complex learnings without frustration, or with only a minimal amount of the frustration which accompanies the "wrong" response, the absence of reinforcement, or extinction. These developments, when applied to discrimination training, are designated by the term fading, and when applied to response skill training, are designated as shaping. We shall consider them separately.

Fading.--Suppose we wish to get a pigeon to discriminate between a fat horizontal bar and a fat vertical bar. The vertical bar is correct and the horizontal bar is incorrect. This will normally require thousands of trials, including many extinction trials.

We know that, with pigeons, discrimination can be established very readily for such colors as red and green. What we now do is to imbed the vertical bar in green and the horizontal bar in red, and maintain our differential reinforcement as before. Food is presented when the green appears and not when the red appears. Discrimination will be established very rapidly. We now slowly fade out the colors surrounding the two bars. The appropriate behavior will be maintained and will continue even when the colors have been completely faded out, that is, the backgrounds of both figures are white. We then will have transferred discriminative control from the color to the bar with very few errors on the part of the animal. There will be very little extinction, and very little accompanying frustration.

Such programming of the environment, through capitalizing upon the existing discriminative repertoire of the organism and gradually fading out these existing elements to others, is the rationale which underlies much of programmed instruction (Holland, 1960). Utilizing this procedure, it has not only been possible to get pigeons to discriminate very rapidly between forms which would otherwise be almost impossible (Terrace, 1963), but it has also been possible to get pre-school children to discriminate between other forms (Moore and Goldiamond, 1964), and it has also been possible rapidly to establish control by such abstractions as concepts (Goldiamond, 1964).

Shaping.--The shaping procedures follow the same logic, but involve changing the behavior rather than changing discriminative stimuli. In this case, we take the ongoing behavior of the organism, and observe it carefully to see if it contains some element which is in the direction we are interested in. When that element occurs, we reinforce. This element may then be maintained, along with other elements which seem further along the direction we are interested in. Eventually, as was indicated earlier, we can get the animal to emit totally novel behaviors such as having a pigeon pecking upright against a disc high up on the wall, rather than pecking in a downward movement toward the ground.

Shaping and fading combined.--These methods can be used in combined form to establish, almost without error, new behaviors under the control of novel stimuli.

Whose is the responsibility?

The foregoing sections suggest that it is possible through appropriate programming to get complex behaviors to occur under complex situations, and to establish such a relationship with very few errors and minimal extinction. An example of the power of such procedures has been demonstrated in our laboratories at the Institute for Behavioral Research, where Ferster has been able to teach chimpanzees to engage in binary enumeration, a form of behavior which is new to the chimpanzee race (Ferster, 1964). That it had not been obtained before suggests that the appropriate conditions for such learning had not been established before. A laboratory course at Arizona State University had students shaping up rats to engage in very complex behavior. At the end of the laboratory period, there would often be about two students in each class who maintained that they had feeble-minded rats--their rats could not learn. These rats were then given to the A students and the rats learned very rapidly. This example is given not to suggest that feeble-mindedness is really not a problem, since it obviously is, but to suggest that if the organism that we are dealing with is not learning, before fixing the blame upon the organism, we should look to our procedrues to see if these are possibly at fault. Are we applying the appropriate technology to get the desired results?

Much of current learning theory has been developed around experimentation in which fading and shaping procedures are not used. In the classic maze experiment, for example, a rat is required to make a left or a right turn. The turn is differentially reinforced, that is, there is food on one side and not on the other. It takes different rats different numbers of trials to learn this behavior. In discrimination training, two cups may be presented to a monkey, one with a triangle, and the other with a circle, again, differential reinforcement is used and often many trials are required to learn which is the correct form. These classical procedures include a considerable amount of extinction and error. On the human level, at least, we know that such error is often accompanied by frustration.

Using fading and shaping procedures, acquisition of the correct behavior or the correct discrimination is not left to the devices of the organism. Rather, every response that the organism engages in provides some information to him, and in the appropriate program every response is reinforced. Under these conditions, it is possible not only to get learning without frustration, but it is often possible to produce learning in a far more rapid and effective manner.

Acquiring self-control

In the ideal learning situation, behaviors established in the training situation are of such a nature that they are then maintained by the outer environment. For example, we learn to read in school, but this behavior is reinforced by the society around us. A problem in music education is to get the child to practice on his own, or to engage in behavior for which reinforcement is not provided by the natural environment around him. Indeed, the environment often acts in entirely the opposite direction; playing with his friends is far more reinforcing than practice. Under such conditions, we may wish to program other kinds of consequences and also to bring the behavior under self-control. We may try to set up the situation so that the child provides his own reinforcers, and his own corrections. An example in this category is training the ear. Ferster and Silva have demonstrated that it is possible to teach the child to differentiate an umlaut from other German sounds by a self-correctional procedure. The child sees an umlaut word, such as für. His initial pronunciation is fur. The problem is to shape his behavior so that he makes the appropriate sound. This is accomplished, in part, by first training his ear. A tape recorder pronounces für. The child must press one of four buttons corresponding to such written words as für, vier, fuhr, and vor. Pressing the correct button produces a consequence which the incorrect buttons do not do. Eventually, the child is able to select the written words appropriate to the sound; his ear has been trained to recognize the sound. Once his ear is trained, he can correct the sounds that he himself produces (Ferster, 1964b).

An analysis of a complex behavioral task

Analysis of the process whereby the behaviors and the discriminative skills are acquired may often prove useful in indicating where things can go wrong in a complex task. In this context, we shall examine learning how to read textual material.

Reading involves control of verbal behavior by different textual stimuli know as letters and words. When the appropriate discriminative control is established, the child says words which can be differentially related to the stimuli on the printed page. This is not yet reading, since we could get a pigeon to engage in different patterns of pecking in response to different textual stimuli. I can read Finnish perfectly well by this definition, since Finnish is written in the Latin alphabet, but I am not reading in the sense of understanding.

What behaviors define the process we call "understanding what we read"? At some particular point, the sounds which we make when we read aloud affect us in the same way that similar sounds made by other people would affect us. Thus, if we read "Look at the ceiling" and react to this in the same way that we would react when somebody else said to us "Look at the ceiling", we are reading with understanding.

We do know, however, that if a sound spectograph were put into our ear, it might record differently when we said "Look" and when another person says "Look", inasmuch as there are differences in bone conduction, tones, and other properties of the word. Reacting to these different stimuli in the same way indicates that the two sets of stimuli are in the same stimulus class. Stated otherwise, there has been a history of similar consequences attached to behaviors in the presence of these two different stimuli. The words "girl" and "dame" are in the same stimulus class since the same consequences are attached to acting on "Look at the girl" or "Look at the dame". That such different stimuli as the sound of our voice and the sound of others' voices control similar behavior suggests a long process of interaction between the reader and other human beings, which is subsumed under socialization. Accordingly, it is not surprising that research in some of the slum areas of Harlem, with children who have been isolated and brought up by nonverbal children while their parents worked, indicates that in order to get some of these children to read, there must first be established a period of socialization and reinforcement of speech in general.

When the child learns to read silently, what may happen is that control by the auditory stimuli fades out and is replaced by minute laryngeal and other muscular movements as his eyes pass over the lines. Partial recognition and other forms of control enter into the process.

The information fallacy

It is often assumed that books contain information or that music scores contain musical information. Books are given to the child, and if his behavior does not change as he goes through the books, it is assumed that there is something wrong either with the book or with the child. In actuality, books and scores are simply stimuli, and there is no reason on earth why such stimuli, no matter how orderly the manner in which they are laid out, should govern any kind of behavior.

For the books to control behavior, that is, for the information to be conveyed, the material in the books must be made discriminative stimuli. Stated otherwise, behavior must occur in the presence of the material, and the behaviors must have differential consequences. If the books do not produce such behavior, lack of learning is not the fault of the books or the score. It is our own fault in that we are asking the books to do what the books cannot of their own do.

If the books are to be discriminative stimuli, there must not only be attached to them a program of required behaviors, but also a program of differential reinforcements attached to the behaviors. This also implies knowing what the appropriate behaviors are and being able to observe them and get them on record so that the appropriate consequences may be applied.

Both reading and writing are currently being taught to preschool children by the means of an electrical typewriter, a program, and other control mechanisms which can shut off the typewriter current or put it on when inappropriate or appropriate responses are made. Such control over reading has involved the use of intermediate devices such as electric typewriters. With regard to music education, it should, however, be pointed out that the devices used in music education are instruments which naturally lend themselves to such programming. We do not have to add an electric typewriter to intervene between the child and the material. We do not have to develop special devices which convert the behavior into discrete responses such as tapping a key. Pianos are such devices. Other instruments contain similar devices. Even the violin requires discrete responses in the fingering by the left hand.

Musical instruments seem to be readily convertible to instruments to which the technology of behavior can be applied. And music also contains certain reinforcers. People pay money to go to concerts and children whistle, practice instruments, and buy records. The instruments, the subjects, and appropriate contingencies are available. What seems to be required to apply the technology of behavior to their linkage is attention to such technology.

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2.2 Specialized Devices and Instructional Systems

Philip Lewis*

Rationale

The Seminar on Music Education held at Yale University during June 1963, "brought together for the first time in an extended and comprehensive session leading representatives of the many disparate elements which comprise the field of music." Some of the important conclusions released in the report on this Cooperative Research Seminar (Music in Our Schools - A Search for Improvement, OE-33033, Bulletin 1964, No. 28) include:

1. The need to bring subject matter and method of teaching in line with contemporary knowledge and culture;
2. The realization that although the United States is a recognized leader in music research, both historical and ethnomusicological, the results of such activity have not touched teachers and pupils in the schools;
3. The requirement that new materials, as well as new ways of teaching will be needed for a curriculum based on these (new) principles, and that much research will be required to devise these materials;
4. All research projects suggested for the improvement of reproduction of musical sound in various media require that basic, developmental and applied research be carried on by engineers and technicians in close collaboration with qualified musicians.

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The purpose of this presentation is to explore the possibilities for the establishment of a perspective or framework within which to apply the products of modern instructional technology consistent with good curricular practice and modern theories of teaching and learning.

Instructional Materials and the Audio-Visual Field

Prior to World War II, the educational materials and A-V fields were comparatively limited. Basic and auxiliary texts, workbooks, an assortment of manipulatives and conventional library items comprised the major sources of supply. Equipment units included the AM/FM radio, the phonograph, filmstrip, slide, motion picture and opaque projectors. As far as duplicating processes were concerned, schools relied mainly on the spirit and stencil varieties--with an occasional offset machine to be found in a technical or vocational high school or college. This summary does not begin to tell the whole story since compartively little was available in the way of films, filmstrips, etc. for use on the machines. Films were aimed at the largest segments of the educational market and were, therefore, general in treatment and not always appropriate for effective instruction.

The term "audio-visual aids" was widely used and still has great currency among educators. An analysis of this label, in terms of practice in the field, reveals that the use of media has been, and to a large extent still is, supplementary to instruction. A film is generally employed, if time permits and if the film is available. A record is used for enrichment listening, usually as a "fill-in: or for students who have finished their regular class assignments. There has not been much accomplished in the way of definite planning for the purposeful use of media in instruction until very recently.

A few years ago, attempts were made to "correlate" existing films, filmstrips and recordings with already published textbooks. This procedure met with little overall success because the materials were not mutually reinforcing. As a next step, some publishers produced such materials as pre-planned approaches to be used appropriately with specific textbooks. More recently a new and encouraging trend appeared as other publishers made available "instructional sets or kits". The media materials were supplied, not as "aids", but as integral parts of the total instructional approach. In such instances it is as essential to use the visuals or the recordings as the more conventional printed materials.

Along with this development, the equipment field itself "exploded" into a proliferation of technological devices designed (so it was claimed) to do the teaching job better and faster than was ever possible in the past. It will be remembered that with the successive advent of phonographs, radio, television and finally teaching machines, very similar claims were made by the enthusiasts that here, indeed, was the final answer to all instructional problems. Unfortunately, these bright promises never materialized for a number of important reasons:

1. Lack of experience and/or the necessary funds to

produce appropriate materials of high quality for use with the various media;

2. The necessity to employ home-type equipment in school situations for uses for which the units were not designed;
3. Lack of technicians and trained personnel in the schools to maintain and to properly operate equipment;
4. Insufficient equipment units in schools to provide for scheduled and non-scheduled use of facilities;
5. Absence of coordination of available facilities installed in schools to provide flexible and imaginative support to the program of education.

With the focus of educational interest on the development of programed learning and teaching machines, beginning about five years ago, renewed attention was given to theories of teaching and learning. Although this field is still much in contention, a great deal of benefit accrued to the profession as a whole. Curricular practices are now beginning to include planning for media as integral to the total approach. It is no longer considered adequate to list activities necessary for the achievement of educational objectives accompanied by another list of resource materials. This re-orientation of curriculum planning will be explained in the material that follows.

The Big Three in Teaching and Learning

In any learning situation there is the important relationship between the teacher, the learner and the materials or media employed. If any one of the conditions in this relationship is varied for either of the three factors, then the other two are also affected. For example, when the teacher lectures to a class, a rather passive condition exists, with the students as mere receptors of the presentation. If the teacher employs, instead, the technique of providing outside study assignments for the students and then follows up with a lively class discussion, the relationships are entirely different. Similarly, if the teacher arranges for a film or programed learning materials to enable the learner to assimilate certain information on his own, rather than the lecture method, the role of the teacher changes and she can then spend more time in individual follow-up of student needs, etc. Further analysis of this kind will reveal that it is impossible to change the learning conditions in any situation without also affecting the respective roles of the students and the teacher.

Avenues for Learning

At the risk of over-simplification, it is possible to identify the three major channels of communication in the teaching-learning process:

1. The teacher working directly with the student(s);
2. The teacher using media (motion pictures, chalkboard, overhead projection, etc.) with the student(s);

3. The student working directly with media (programed learning, learning laboratories, carrells with instructional facilities, etc.).

There should be no distinction made as to the preference of one approach over the other. Rather, the channel selected for a particular purpose must be best for a specific situation. In this way all communication channels are utilized through a selective process based upon varying needs of the learner and the capabilities of the medium involved.

Instructional Systems-Technological

One of the greatest obstacles to optimum use of educational technology in schools has been the ever-increasing burden placed upon the teacher in arranging for equipment and in obtaining materials for use with the equipment. Despite the fact that projectors, phonographs and manipulatives have been reduced both in size and weight and improved in terms of capabilities, the teacher still has to do much of the time-consuming work in setting up the learning environments.

Recently many schools have installed, as standard equipment, such facilities as intercommunication networks, language laboratories, internal telephone systems, TV distribution cables and even closed circuit television systems. These conveniences, however, have been separate and disassociated facilities. In some rare instances attempts have been made to combine the separate systems to take advantage of the multiple possibilities of such hookups.

It may be helpful to describe what can be done with present-day "hardware" to assemble and coordinate a communications system that will go beyond conventional practice and still not involve an appreciable increase in capital investment. The description that follows can be installed in a variety of ways and at different levels of sophistication in existing buildings or in new structures:

1. Starting with the intercommunication system, the control console would be placed in a "Communications Center". A sub-console would be installed in the school office for administrative purposes. Each classroom would be equipped with from two to four ceiling-mounted loudspeakers for low-level sound distribution. There would be a plug-in jack at the back and another at the front of each room. With these, it is possible to plug in the audio from a motion picture projector placed at the rear of the room to utilize the overhead speakers for adequate sound reproduction. If desired, the speakers can also be wired for reproducing stereo sound. Similarly, record and tape players can be connected through the same system at the front of the room. Whenever such accessories are employed, some of the speakers would be taken out of the intercom circuit, leaving only a single reproducer available to handle messages from the office or from other rooms. If it is necessary to make a recording of a class discussion, solo presentations, or group instrumental

music performances, etc., a teachers call message to the "Communications Center" will enable the operator there to reverse the speaker circuits so they will operate as microphones, to feed the recorders in the Center. Such an arrangement requires the addition of more audio pairs emanating from the console, but this feature represents a minor cost. The console would also be fitted with playbacks, recorders, AM/FM tuner, perhaps a short-wave tuner, and any other special equipment suited to the local needs.

2. The internal telephone system would perform the conventional functions, but additional circuits must be provided. In this way it is possible for the classroom teacher to dial up a program from the Center and have it reproduced over the speaker system in the room without further effort. The playback units are, preferably, remote-controlled, but such equipment is already available from several manufacturers.
3. Another bonus available through the modified intercom system is that of centralized dictation. A wall plate, incorporating a microphone jack and a pilot light, is all that is needed in the classroom. When the teacher desires to dictate a letter or a report, she need only plug in the microphone and narrate the information. A recording would then be made automatically in the Center and the belts or discs so processed would be sent to the pool stenographer for transcription. If

the pilot light is "on", it would indicate that the line is temporarily "busy". Multiple recording machines can be installed to handle whatever load is involved.

4. With the development of the language laboratory, many techniques were evolved which have important applications for virtually all subjects and phases of learning. Tapes can be programed for independent study, recordings are available for enrichment listening, and listening programs have been coordinated with visual projection for either individual or group consumption. The recent liberalization of Title III, National Defense Education Act, now includes language arts and social studies, in addition to mathematics, science and foreign language areas. It is only a matter of time until the language laboratory becomes the learning laboratory to be employed with all subjects. Some modern labs have been equipped so that none of the "hardware" is installed in the student booths. Instead, all of the functions of the individual tape recorders are controlled remotely by means of buttons in the booth. Other language laboratories are used, also, as program centers to serve other classrooms equipped for multiple-channels of listening. It is easy to envision the removal of the booths from the laboratory and their separate relocation in hall areas all over a school building. In this way, individual study carrells result, but with the electronic connections that

enable students to study on their own. Thus, if the proper control and storage facilities are placed in the Center, the programs become available for this exciting application.

5. It was just a decade ago that commercial videotape recorders became available for TV broadcast operations. This development, together with the coaxial cable and microwave network over the country, revolutionized the industry. It became possible to electronically transmit television programs to stations for recording on the local units and subsequent release over broadcast outlets at convenient local times or for multiple re-use. Until about four years ago, these videotape recorders were large enough in physical size to fill a fifteen foot wall to a height of some six or seven feet. The cost was in proportion--approximately $60,000 per recorder with black and white capabilities. Recently, the recorders came down in size and price to a range of $35,000-$50,000. Such units were still out of the realm of consideration for popular use in schools and colleges, except for perhaps a few of the larger, well-endowed institutions. Toward the close of 1962, a solid-state, miniaturized VTR was developed and marketed early in 1964. This modern electronic miracle weighed 65 pounds, was no larger than a table-top phonograph, and was priced in the $12,000 range. At present there are four similar and competitive

products available. Two companies have already reported the experimental development of even smaller models that will employ ¼" tape and be of the physical dimensions of the regular audio tape recorder. It is not expected, however, that such products will be available for another 2 or 3 years, but the prospect is most exciting. A few illustrations of use of the videotape recorder in school situations will help to point up the many possibilities available:

a. The small VTR together with a Vidicon TV camera (no larger than a loaf of bread) and a few other simple components may be placed on a mobile cart and wheeled into any room or location to record both the video and audio of the selected activity. It is only necessary to rewind the tape to prepare it for replay through one or more TV sets or through a closed circuit network for wider distribution. Similarly, the equipment is portable enough to take to field locations for similar recordings.

b. Recordings can be made in the classroom of vocal solos, group presentations, samples of instrumental renderings, fingering techniques, etc. and these recordings can be reproduced without loss of time to permit discussion and analysis with the persons concerned.

c. Off-the-air recordings may be stored on tape for release at convenient times. Famous visitors, musicians and others who perform at the school may be "taped" for re-use with other class groups. It is also possible to play back tapes with slow-motion and with stop motion for many types of analysis of techniques.

6. Teachers often wish for a method to provide immediate feedback from their students so that they can determine the degree of impact and the success of their efforts. Traditionally, it has been necessary to construct written examinations or objective tests that involve a substantial time delay before the results become available. From time to time experiments have been conducted with responders and response systems. At present several commercial models are on the market. It is possible to equip all of the students' seats or work stations in a classroom or auditorium with multiple-button responders. As material is presented by lecture, multi--media, panel, or symposium, the students respond to questions presented on slides or through some other pertinent means. As the participants depress the buttons indicating their choices, the instructor receives an immediate readout on meters calibrated in percentiles, and can stop the lesson to research, if necessary, or proceed with the knowledge that the information is being assimilated. Group-paced programed learning, test

validation and other exciting by-products are possible with such a system. Further development permits connection of the responders to a memory storage unit which "feeds" a computer. In this way, the responses from each student for each item is graded and printed on "hard copies" for immediate use by the instructor.

The facilities and combinations of communications and learning devices that have been described are by no means a thorough treatment of the possibilities in this field. Hundreds of different combinations of technological developments can be designed to meet important instructional challenges for each local situation--large or small. The implications need not be by-passed by any institution because of lack of funds. A communications system can be installed as a basic network of wires and cables at a cost within reach of all. Components and terminal equipment can be added as needs arise and as funds become available. Many of the equipment items now available in most schools can be adapted for use with the overall system. There is still a great and continuing need to use separate units of equipment for specific applications, but the "systems" approach provides flexibility and resources that must not be ignored or overlooked in the years ahead.

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2.3. Audio Media in Music Education

Raymond Wyman*

The American teacher once lived in a comfortable and relatively stable world in which a brief period of general preparation would suffice for a lifetime of work. The teacher now finds himself in the middle of a content revolution constantly fired by subject matter specialists and a methods revolution constantly fired by psychologists and technologists. Questions which were never asked before must now be answered by teachers every day. What are the behavioral goals of this particular topic or unit of work? How do you expect your students to be different when they have completed this work? How will you know that desirable changes have taken place? How have you provided for the differing interests and abilities of your students? What devices or hardware and materials or programs are available to help you to present realistic, interesting and challenging learning experiences for your students?

Everyone agrees that a teacher must be an expert in the subject matter that he teaches. An equally important requirement is that his expertness, at least to some degree, must be transferred or communicated to the students who are with the teacher. Subject matter skills and communication skills do not necessarily have anything in common. However, either skill can be learned, and both need to be considered in the preparation or improvement of teachers.

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Much has been learned about learning in recent years. Clever teachers are able to translate their concepts, knowledge, ideas and abilities into stimuli and cues of many kinds that are exposed to their students who then perceive and reconstruct the needed outcomes of education. Many models for learning have been constructed. There is considerable agreement that students learn best when they are ready, motivated and interested. Learning is facilitated when presentations are multisensory, lifelike, meaningful and related to basic needs. Students should be healthy, comfortable and cheerful. Students must be active participants in the learning process with responsibilities that they understand, and want to carry out.

Technology has provided the teacher with a tremendous range of devices for presenting stimuli to the eyes and ears of students. Some of these are briefly and rapidly incorporated into the presentation of the teacher. Others become the total presentation for periods of time when the teacher is free to do other things. Non-professional assistants can expose excellent presentations with the help of modern technology. Students can oftentimes be their own operators of presentation equipment.

Education has traditionally been conducted with about thirty students working with one teacher who guided all of the activities in one isolated teaching area. Much experimentation is going on today with large group presentations, small group discussions around a table, and individual study. Terms of specialized personnel and modern technological devices must be used to obtain optimum results.

It is important to distinguish between equipment or hardware and the material or program. Technologists have succeeded in making excellent equipment. The materials contributed by educators to go with the equipment have often been rather poor in comparison. It is essential that competent educators prepare excellent programs to be presented through suitable machines.

The question today does not seem to be whether technological devices should be used in education, but rather, how they should be used. Every teacher needs to make informed choices for every presentation.

The pace for the technological revolution in communication has been set by the audio media. We now have the ability to capture, store and reproduce the sounds of our world with greater faithfulness than any other human experience. Not only can we capture, store and reproduce all of the sounds that can be heard, but we can do excellent work with ease and economy. We can also alter, rearrange, combine and amplify sounds to produce almost any result desired. We can reproduce sounds for one or many, and in private or public, and over any distance. The possibilities are almost limitless.

The music educator is primarily concerned with audio experiences, both those produced by experts and those produced by his students. It would seem that the music educator would be most familiar with available devices and techniques for producing, recording, storing, distributing and reproducing sounds. It may be that an anti-"technician" and anti-"canned" complex has interfered with a study and acceptance of selected devices and techniques.

The following audio devices are either available in typical schools or readily available for purchase. Each device is identified and briefly described in this paper, and then questions are proposed for the music educator. The answers to these questions are not known to this consultant. The answers may not be known to the music educator without careful consideration or experimentation. The aim of this conference is not to promote the indiscriminate use of technological devices, but to promote the wide and good use of those that will help to do better that which should be done anyway. It is one thing to refrain from using a device through ignorance, and quite another to refrain from using it because trial and consideration have shown that something else does the required job better, more easily, or less expensively.

Tape recorders have reached a remarkable stage of development. Some are so portable that they can be put in a handbag or brief case and used anywhere one can go. Some are so faithful that trained ears cannot distinguish the recording from the original. Some are so inexpensive that they can be permanent parts of a classroom. Most school-type recorders now have a "pause" or instant stop device; timer or counter to locate a spot on the tape; output jack for external loudspeaker or earphones; external jack for connection to a hi-fi amplifier or central sound system; and an auxiliary input for recoriing from sources other than a microphone. Some recorders are designed for stereo, sound on sound, and other special effects. What uses might the music educator have for:

(1) Interviewing a conductor before or after a performance?

(2) Recording parts of a professional performance for class study?

(3) Recording parts of old, rare or unusual discs?

(4) Stereo to show the positions of various instruments?

(5) Short sequences from contrasting or similar pieces in close proximity?

(6) Recordings to let an individual hear how he sounds with his group?

(7) Recordings before and after student techniques are perfected?

(8) Various degrees of fidelity?

(9) Special microphones and loudspeakers?

(10) Tone controls and mixers?

(11) The National Tape Recording Library?

Record players have been popular in schools for half a century. Many schools now have one in every classroom. They are available with various degrees of fidelity and flexibility. Some questions might be:

(1) What do published specifications mean?

(2) What uses can be made of speed or tempo control?

(3) How can a two-channel machine be used for closed circuit radio work?

(4) What uses can be made of pause controls and spot locating devices?

(5) How important is stereo for music appreciation?

(6) Can children actually determine whether a sample is stereo or not?

(7) What uses are there for record players with earphones?

(8) How does one locate unusual recordings?

Radio has long been considered and seldom been well used in our schools. A wealth of musical material is available for free reception. Much of FM programming is the same or similar to that needed for school work. Receivers for school use are available with excellent fidelity. Schools can own and operate their own 10-watt or higher powered FM stations. Short wave receivers can tune foreign stations for music and commentary. Some questions might be:

(1) How are good recordings made from a radio?

(2) How is good reception obtained in a steel building?

(3) What do receiver specifications mean?

(4) How does one find what is being broadcast on FM and shortwave?

(5) How can one receive and use FM stereo broadcasts?

(6) How does a school system go about licensing and constructing its own broadcast station?

(7) How would a school station be programmed and operated?

Central sound systems have become almost universal in new schools. Their tuners, turntables, microphones, speakers and tape decks make them a reasonable substitute for a small radio station. Unfortunately, their most common function is searching for lost objects or people. Might they be used for:

(1) Listening to music and commentators from broadcast stations in selected rooms?

(2) Having a clerk or technician record programs from inside or outside the school?

(3) Use it as closed circuit radio with students introducing records, their fellow performers, etc.? (They might also use it to advertize their coming performances or outside significant musical events.)

(4) Use it for a musical part of opening exercises?

(5) Listening to short wave, weak or distant stations that could not be received on a classroom radio?

(6) Add background music for certain periods or places?

Earphones have been mentioned in connection with other devices. Many schools are now purchasing hundreds of sets of these for individual listening in language labs, libraries, and parts of classrooms. Ordinary, high fidelity and stereo versions are available. They can be connected to radios, tape recorders and record players. Groups of earphones can be used with a jackbox. Could they be used to individualize music education by:

(1) Assigning certain listening tasks at student's convenience in classroom, library, AV center, etc.?

(2) Allowing students to listen to music as well as read books in their spare time in classroom or library?

(3) Providing excellent stereo reproduction in a room that is not designed or equipped for loudspeaker stereo?

Language laboratories are now found in many schools. They were purchased and installed at considerable expense, primarily for language work. Most of them have enough fidelity for some work with music. Some allow only listening to material on tape or discs. Might these installations be used for:

(1) Assigned listening during scheduled lab periods?

(2) Optional listening when a student desired it?

(3) Giving examinations on musical material?

Some language laboratories permit a student to listen to sounds, attempt to duplicate them, and then compare the original with his reproduction. Questions could be asked on one track and answered on another. Could these be used for:

(1) Identifying pitch, time, period, composer, etc.?

(2) Trying to duplicate certain tones, musical devices, or techniques?

(3) Preparing a commentary to go with a selection?

Tape editing devices are available at low cost so that teachers can make changes in tapes in order to have them custom tailored for a particular purpose. Could editing produce:

(1) A rapid sequence of short excerpts to illustrate a certain style?

(2) Shortened versions of long works to fit a time schedule?

(3) Sequences from a composer or performer to indicate maturing or aging?

(4) Juxtaposition of parts of a piece for special effect or discussion?

Sound filters or special tone controls are available to select, alter, or emphasize certain groups of frequencies. Might these be used in comparing various instruments or studying harmonic relationships?

Tone generators are regularly used in science classes to produce any audible pure tone which can be fed into any amplifier. Could these be used with tape recorders or sound reproducers in identifying pitch, frequency response or harmonic relationships?

Oscilloscopes are also used in science teaching to make sound waves visible to students. Could one of these be used in conjunction with the tone generator and audio equipment to explain amplitude, frequency and quality? Could it be used to show how some equipment distorts or alters sound waves?

Consoles or mixers are available for combining and selectively amplifying a variety of sounds. These are commonly found in recording and radio studios. Might one be helpful in creating a library of recorded selections to be used in a music course?

Bell and Howell has a new record-playback machine that uses a card with a magnetic stripe on it. It was designed for foreign word and phrase use. Might it be used for identifying or duplicating certain musical sounds or terms?

Reverberation devices are available for adding this effect to any sound. Might they be used to duplicate the effect of a large hall in a small listening room?

Telelectures enable a class to have an amplified telephone conversation with a person at any distant point where an ordinary telephone is available. The fidelity is ordinarily poor. Might telelectures be used to discuss a performance with a conductor or performer or to discuss a composition with its composer?

Acoustical treatment for performing and listening areas is available. What is the effect on music of increasing or decreasing sound-absorbent material?

With modern audio equipment it is possible to expose all of our students to music made by others and music made by themselves. Exposure to music and desirable modification of student behavior are by no means simple cause and effect. It is possible that imaginative and clever use of modern audio equipment will enable us to prepare exposures to music that will produce the desired effect in a majority of students.

2.4. Potential Uses of Films and Television in Music Education

C. R. Carpenter*

The main question to be explored by this paper is the following: what uses can be made of films and television in music education? There are many related questions which we may wish to discuss during the Conference. For example:

1. Why should we consider the question of the use of films and television in music education?
2. What are the possible gains or advantages, if any, in the use of films and television?
3. What is meant by films and television in terms of different patterns or ways of using these media, of arranging instructional programs employing these media, and of using them in combination with other instructional materials and learning procedures?
4. Under what conditions is it desirable and practical to use films and television in music education?
5. What are some new and untried possibilities for using these media?
6. Can research and experimentation become an approach for "probing the potentials of new educational media" and for advancing and improving music education?
7. Indeed, does music education need or require advancement and improvement?

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8. Are the requirements, expectations, goals and values of music education already being met or achieved?

Music education is assumed to be a very complex area of instruction and learning. In its complexity, it is comparable to the areas of the sciences, mathematics and languages. The instructional and learning requirements are very diverse; they are not homogeneous.

If these assumed conditions prevail, then what are the specific requirements, functions, uses and training objectives that films and television may serve when they are properly used?

How, indeed, do we use films and television appropriately, effectively and efficiently in the areas of the arts and music education? Can the new media, when properly used, appropriately reduce the expanding demands now being made on instructors? What kinds of art and music instruction and learning, if any, can be "automated" by films or television? Can learning efficiency be significantly increased for some kinds of acquisitions of musical performances? Will it be possible to either individualize or socialize (teach large groups) music instruction through the use of films and television? What are the possibilities of "mass instruction" in music using the mass media which have such great capacity for the distribution of instructional materials and stimulation? How can tele-instruction be managed, instructional displays organized, fitting responses and practice regulated and controlled, and performances evaluated?

These and many other questions spawned by the discussion of them will need to be considered objectively, systematically and intensively if the Conference on Educational Media in Music Education is to be truly "probing and exploratory."

It might be observed that there are areas in the academic landscape where tradition and authority have so strongly dominated the approaches, viewpoints and practices that many of the questions raised cannot be usefully discussed.

There may already be satisfactory answers based on experience and experimentation to many of the important questions that are central to the issues of this conference. Although, as music educators and investigators of the media, their uses and characteristics, we may through discussions and the assessment of evidence, arrive at the answers. Nevertheless, the questions should first be asked. It should be both fascinating and profitable to present and compare answers which have been derived from different approaches, by different people who have very different values.

This paper is more of a probing than a position paper. The area being explored is one the one hand so mature and on the other, that of films and television, so young, that none of us should have a clear and firm position. The following observations and concepts are tentative statements that are formulated to be provocative of discussions rather than authoritative answers to serious questions:

Those who planned this conference must have assumed that music education can be advanced and improved; that music education is not perfect but has definable needs and requirements that should be considered. There would seem to be the assumption, also, that films and television, used perhaps in ways yet untried, can meet these needs. Surely these assumptions require validation by research and development work directly in the field of music. In the meantime, let us look at some observations, concepts and evidence from kindred fields which have bearing on the issues of this conference.

Consider this condition: if music instruction and learning are totally different processes from other skills including language performances, then what has been learned in these other areas does not apply. What is your position in this issue?

It seems most probable that instruction and learning of musical performances, be they of complexities which include perceptual, cognitive, affective and motor components, are similar to, but not identical with many other kinds of perceptual-motor activities. To the degree that the learning of musical performances are similar to other perceptual-motor skills, the results of studies in these fields will apply in music education. To the extent that there are important differences, new research and experimentation will be required.

Two lines of action are suggested. First, studies should be made of the dependable information about the principles, requirements and conditions for teaching and learning skills similar to those involved in singing, e.g., language learning and speech, and in instrumental performances, e.g., marksmanship, typing, and the operation of complex and sensitive machines. The second line of action should be research to establish the extent to which previous research results transfer or apply in music education, and to determine how the new media, i.e., films and television, can be applied where the performance requirements are so vastly different from those that have been studied.

It will be surprising if there are not many issues lacking agreement between learning psychologists and music educators. However, there is one point where agreement is essential; namely, that experimentation and research can and should be applied to gain and adapt the evidence needed for understanding, managing and regulating the acquisition, maturation and performance of many types of musical skills.

There are two intriguing observations on the relation of music education to films and television. Many musicians, and perhaps some music educators, if they are interested in the career motivations of their students, view films and television merely as potential "markets", as places or media which consume music. It is improbable that these media have been considered as parts of a system of modern technology which could be employed to aid in the expanding job of providing adequate music education for the multiplying millions of people in this country and the world.

The second observation is more difficult to describe but the phenomena involved probably have much importance for the use of films and television for education and training in music. Films and television are representational: their content, whether of the pictorial or auditory channels, is usually about something. the situation, the object, the drama or the processes are represented by the film or television. It is different when music is the content: music is the content and it is not representational of something else that is not music.

Those of us who have investigated instructional films have been much concerned with the problem of realism or authenticity of the content of the films and television. It is possible that the problem of realism has a very different complexion when music is the content and musical performances are the objectives of the education and training efforts.

When, during the conference, consideration is given to the characteristics of films and television media and their appropriateness for use in music education, another line of thinking needs to be explored: music is predominantly auditory as an end product. However, films and television both have broad bands or channel capacities for pictorial and graphic modes of information. Hence, the question arises of how the video channels should be used in music instruction, and of how the video and audio channels can be optimally interrelated for providing organized learning cues in musical performances that are being learned.

The question of technical limitations on the quality of musical recordings and reproductions is raised also as part of the consideration of the characteristics of films and television for training. Repeatedly, during the Yale Conference on Music Education, this point was emphasized. There are several relevant considerations: what are the levels of quality required for the different levels of musical training? The same technical quality may not be needed for elementary discrimination training and "modeling comparisons" as for advanced and finer discrimination training. A second consideration is that of determining what quality standards are necessary and of how these engineering standands can be achieved. Neither films nor television should be accepted as they are. After all, they are "mass media" and most of the equipment is designed for the "mass market". Both the video and audio aspects of television urgently need improvement in average quality. Improvements can also be made in film recordings when higher standards are necessary and these are defined.

Films and television should not be accepted merely as they are, or are stereotypically conceived to be, in terms of their form and content. There are great challenges for invention, development and creativity in designing new forms and methods of media uses for special instructional purposes, including music education.

The following are a few examples of relatively new configurations which might be adapted for films and television and applied in music education.

We at Penn State during the vigorous ten years of life at the Instructional Film Research Program produced an exploratory series of short films showing in great detail by close-up photography, and I believe in varied speeds, the fingering actions for several musical instruments. Precision action patterns, their sequencing and timing, were by appropriate motion picture photography analyzed, recorded and projected. The actions were brought within the field of observation much more visually and forcefully than could be done by the usual direct demonstration It is easy to visualize such films arranged in short film loops, perhaps in a graded series of performance levels determined to be best for different learners.

serving as models for the students of instrumental music. Again, more recently, and still on an exploratory level, we have made extreme close-ups of language behavior of the mouth associated with speaking German. These films suggest that this medium and method might be useful in providing some of the necessary conditions for learning to sing.

Television has been tested extensively for perceptual-motor skills training. Using simple closed circuit systems, it is possible to provide for trainees conditions which permit them to see close-ups of their performances in various time relationships to their performances. Thus, by means of television, visual "feedback" and reinforcement can be added to kinesthetic and auditory "feedback" or regulatory cues in improving or perfecting the perceptual-motor skills. In addition, now with video tape, it is possible for musical performers to have available immediately records of their performances while training or practice sessions are in progress.

Apparently one of the great problems or requirements of musical training is that of practice. Surely from the logistical point of view, the requirements of time, space and musical instruments add up to major demands on institutional resources and funds. These requirements also set limits to the number of students who can be accommodated and the practice opportunities for those who have any access to what they need in large universities. I merely raise these problems and ask a question: are there any possibilities of so using films and television as to reduce the traditional requirements for practice time, space and instruments?

Experimentation may lead to new definitions of the amounts of practice required to reach given levels of performance. It is suggested that emphasis on discrimination training and on training in musical imagery of ideal standards to be achieved would result in reduced emphasis on drill and practice. Furthermore, it is not known that the most efficient patterns of amounts and sequences of practice have been determined for musical education.

Another relatively new and promising development which has reached the prototype stage is the film test. Using the video and audio components, it is possible to develop new kinds of examinations especially for assessing information and discrimination learning. In fact, as in good programed learning, teaching, testing and learning should proceed concurrently, so with possible film and television instruction, testing with subsequent "knowledge of results" and "reinforcement" can proceed simultaneously with instruction. It is now feasible by several means to make complete and accurate records of responses to objective-type questions of a wide variety of types. These records can be made in home study situations as well as in individual or large class instructional situations. Films and television can be adapted for providing new kinds of tests and examinations which include informational modes especially appropriate for music education.

Films and television are mass media. Their greatest potentials are for the distribution of information, instruction or "displays" which are designed and produced to contribute to musical education. These instruments, especially when radio is added, as indeed it should be added, have contributed enormously to informal musical education. This nation and the world has millions more musical literates because we live in an era when the mass media have been and are being developed.

Leonard Bernstein, using a full orchestra and a national television network, can instruct up to fifty million people in a class in music. To what effect? Are music educators pleased? Is the extensive employment of mass media for the extensive distribution of instruction in music appreciation accepted and approved by music educators, or are such efforts traumatic insults to the formal musical arts?

What could be done in the future if music educators could command the services of a national television network with adequate film and video tape productions for significant and sustained programming of instruction in music? What could be done with a national network of stereophonic radio? What should be the role of music educators in the development of national educational television and in a needed re-vitalization of radio as an instrument for bringing music as an essential component of culture to increasing millions of people? Is it possible that formal musical education has important leadership roles and responsibilities in these "mass" culture developments?

It was suggested earlier that the media under consideration should not be taken as they are now but considered as they might become when molded and adapted for specific educational purposes. Programmed learning procedures are being emphasized at this conference. A challenging possibility with which we at Penn State experimented is that of combining basic learning principles, including those principles emphasized by programming procedures with the new media. It is possible that this combination of media and programming of a new kind would greatly extend our instructional resources to millions of our people especially in the area that psychologists define as discrimination training. These exploratory experiments brought into play another use of the distributive media. A basic problem is one of deciding how to use in synchrony the video and audio channels. One of the subjects we used at Penn State was algebra. What visuals are most appropriate and congruent with algebraic concepts and relations? Clearly the answer is: algebraic symbols. Thus, television is demonstrated to be a very efficient printing system when the bias against using electronic printing is set aside. What do these points mean for music education? I am suggesting that films and television can be used to teach the reading of musical notations and the sign-symbol systems of music. By using the media resources already available for purposes of training in music and the other arts, artistic literacy might be significantly advanced and extended to millions of people.

It has been the purpose of this probing paper to begin the processes of inquiry and discourse that will be continued during the work sessions of the conference in Washington during the days of December 7 - 11.

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Prepared by Loretta M. Stallings

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2.5. Printed Materials in America's Educational Technology

Robert E. Slaughter*

Printed Materials Include More Than Textbooks

Printed materials** used for instructional purposes in America's schools and colleges embrace much more than textbooks. In addition to textbooks, printed materials that are widely used include workbooks, text-workbooks, paperbacks, tests, periodicals, and encyclopedias and reference books.

Textbooks. The textbook is the oldest, best known, and most widely used type of printed materials of instruction. In addition to being published as an independent, single item, the textbook is often published as the central component in a program or related group of printed materials of instruction.

At one time, the textbook was largely a compendium of information. Today, it continues to offer a core of information, but its real function is that of a guide to learning.

The textbook is a source of subject matter and a guide to elaboration on that subject matter. At its best, it offers subject matter that is adequate, up-to-date, and of most worth for the purpose. All major curriculum commissions and projects such as the Physical Science Study Committee, the Biological Sciences Curriculum Study, and the Chemical Bond Approach Project, to name a few, have incorporated into textbooks that they have prepared subject matter that they consider adequate, up-to-date, and of most worth for their respective purposes.

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**In this report, printed materials are confined to those printed on paper. They do not include materials printed on film or any medium other than paper.

Note: Programmed books are not specifically mentioned at this point in this report since they are distinguished not so much by their external physical format as they are by their internal content and presentation. However, programmed materials are treated separately in a later section in this report.

The textbook helps set goals and organize and unify an instructional program. It includes illustrations, diagrams, and charts; reading and study aids; exercises, projects, and activities; references to related readings; and typographical features -- all designed to guide learning.

In those instances where the textbook is the central or principal component in a program of instructional materials, it is a base of correlation and a guide to the use of other materials in the program.

Workbooks. The workbook, a relatively recent development in printed materials of instruction, is essentially a self-instructing instrument correlated with a textbook. In its best form it supplements the textbook by fulfilling such functions as guiding the student's learning effort; giving added emphasis to certain topics; developing understanding, insights, and relationships; and providing drills in skill subjects. Along with its contribution to learning, the workbook is a valuable time-saving instructional tool. The workbook is usually bound in paper.

Text-workbooks. The text-workbook is a means of combining effectively the content function of the textbook and the learning-guide and application function of the workbook. It lends itself best to relatively short units of instruction where the quantity of subject matter is relatively limited and where time is a factor. The text-workbook, which is usually bound in paper, offers the principal advantages of economy and immediacy of application in working with subject matter. The programmed book in which the learner is provided with the programmed material and makes and enters his response is a type of text-workbook.

Paperbacks. This item of printed material is one that requires careful definition in order to contrast it with other printed materials that are bound in paper, such as workbooks, text-workbooks, pamphlets, and monographs. Paperbacks usually have the characteristics of books that are ordinarily bound in cloth-on-board, or hardbound.. As a matter of fact, paperbacks originated as reprints, bound in paper, of hardbound books. Today, however, some books are produced originally as paperbacks.

Generally speaking, paperbacks are relatively small books, and they do not involve intricate illustrations, color printing, or other typographic features that are costly from a manufacturing standpoint. The principal advantage of the paperback is economy, along with convenience and ease of use, and this advantage cannot be obtained if costs of manufacturing the paperback are too high.

It is important to note, however, that paperbacks may be classified as mass paperbacks or as quality paperbacks. The former are devoted to subjects with mass appeal; they are relatively low priced, manufactured in large quantities, and sold through mass channels of distribution, such as drug stores, supermarkets, and discount houses. Quality paperbacks are usually devoted to selective subjects with relatively limited appeal; they are manufactured in comparatively smaller quantities and sell at higher prices than mass paperbacks; and they are distributed through established book-selling channels, such as book stores, including college and school book stores.

It is the quality paperback that is ordinarily used for educational purposes. Quality paperback sales for educational purposes in schools and colleges are approximately 50,000,000 copies a year.

Periodicals. Periodical literature published on a weekly or monthly basis for educational purposes is used much more widely in classrooms than is generally realized. It is estimated that more than one-half of all students in grades one through twelve use materials of this nature. It is particularly useful in adding a timely, live dimension to the teaching of such subjects as reading, history, civics, geography, economics, the sciences, English, and home economics. The potential of periodicals in the teaching of music has perhaps not been fully explored. Periodical literature for classroom use is prepared and issued by a number of publishers of news and literary magazines and metropolitan daily newspapers as well as by educational publishers.

Tests. It is common practice for educational publishers to publish objective-type achievement tests correlated with textbooks. In addition, standardized tests for measurement, diagnostic, and guidance purposes are widely used. They are prepared and published, often with scoring services, by organizations, specializing in the field, and by established educational publishing houses. Annual sales of standardized tests are in excess of $13,000,000.

Encyclopedias and Reference Works. The use of source books, such as encyclopedias and dictionaries, is growing rapidly in American education. They are often found in classrooms as well as in libraries where they are usually made available. In addition, they are commonly found in the home. Sales of such materials are approximately $400,000,000 annually, with encyclopedias accounting for more than 90 percent of the volume.

Early History of Printed Materials in American Education

Printed materials in American education date back to the Colonial days. The Hornbook, which was no more than a one-page manuscript pasted on a board paddle with a sheet of horn drawn over it to prevent soil, was probably brought to America on the Mayflower. The alphabet, the vowels and consonants, numerals, and the Lord's Prayer were usually the printed matter contained in the Hornbook. This simple, rather primitive teaching instrument using print was in use up to the time of the Revolutionary War.

Coote's "The English School Master" was published in 1596 and was imported and used in the Colonial period. It was a 72-page book, containing spelling lessons, a little arithmetic, a little history, and a short catechism.

Comenius' "Orbus Pictus", or "World Illustrated", was published in Germany in 1657 and was imported and used in the Colonies. Using some 150 wood cuts it was the first illustrated text of any importance. It illustrated the alphabet and then moved to illustrations of human activities, such as the work of a blacksmith.

Stephen Daye assembled the first printing press in the Colonies in 1639, and printed a spelling book, which was the first American textbook; but it had little acceptance and use.

The first American textbook of importance was "The New England Primer", which was published by Benjamin Harris about 1690. It was widely accepted and sales ran into hundreds of thousands of copies. It was printed from movable type and was bound by hand in covers made from thin oak, with a **rough** blue paper pasted over the oak.

In 1783, Noah Webster, a Yale graduate and a teacher, wrote and published a book with spelling and pronunciation based on American usage rather than British, titled "The First Part of a Grammatical Institute of the English Language". It combined spelling, reading, and grammar. Webster campaigned successfully for copyright protection. He promoted the book widely and sold rights to others to issue it in such cities as Boston, Albany, New York, and Philadelphia. In 1817, he revised the book and changed its title to "The American Spelling Book".

By 1818, 5,000,000 copies of the Webster spelling book had been sold, and for forty years thereafter it sold at the rate of 1,000,000 copies a year. The book was printed from movable type and was bound by hand in thin oak boards with dull blue paper pasted over the boards.

The McGuffey reader was the first book to rival the Webster blue-back speller. It was published in 1830, and by 1841 William Holmes McGuffey, the originator of the McGuffey Reader, and his brother, Alexander, had completed a series of readers through the fifth grade. This series became the literary bible of children and adults.

By 1920, ninety years later, sales of the McGuffey Readers had passed the 122,000,000 copy mark; and the books are still in print today. After 1840, these books were printed from stereo-type plates, and in the 1860's they were printed from electrotype plates.

Early Support of Teaching Apparatus

In the 1830's, educators such as Horace Mann and Henry Barnard, accepted the fact that teaching apparatus, the term used for textbooks and other teaching aids in those days, could make valuable contributions to education; and they advocated their use. Normal schools were getting their start in the late 1830's, and they, too, encouraged the use of teaching apparatus.

Peddlers sold books along with other wares. In 1826, Josiah Holbrook established in Boston an educational exchange for the sale of teaching appratus. The business was expanded to include agencies in several parts of the country. Teaching apparatus was advertised in educational journals. All this promotion of teaching apparatus was naturally a factor in its acceptance, purchase, and use.

By the 1870's and 1880's there were passed some school laws requiring the use of teaching apparatus, including textbooks, which were being published in increasing numbers and in a range of subjects that included arithmetic, geography, physiology, Latin, Greek, and history. They employed the benefits of improvements in the technology of printing to improve the printing, binding, and graphic quality of textbooks, including halftone illustrations and color printing, which made their appearance in the 1880's.

With Webster's blue-back speller and McGuffey's readers, textbook publishing became an established commercial enterprise in America. Textbooks were advocated as a part of our growing educational technology. Copyrights were reasonably secure. Textbooks were manufactured and sold in quantity and profitably. Their alliance with educational progress and development had been demonstrated.

Printed Materials in Today's Educational Technology

Educational technology, including printed materials of instruction, is becoming increasingly vital to success in achieving the purposes and objectives of education. It contributes directly to instruction, and adds to the productivity of the entire education enterprise.

The vital importance of educational technology is accentuated by:

1. Sharp and prolonged increases in population.
2. Revolutionary discoveries of new theory and proliferation of knowledge.
3. The growing demands on education for educational achievement.
4. Increased emphasis on subject matter and insights into the structure of disciplines.
5. New theories of learning.
6. New advances in communications technology.

7. New curriculum content and plans of curriculum organization and sequencing.
8. New plans of organization for instruction and faculty utilization.

Printed materials of instruction have a distinctive contribution to make to educational technology. They are a source of subject matter and learning guidance that can be used and reused by the learner. They can be used at almost any time desired and almost anywhere desired. They can be used by the learner independently or in group work. They can be used at a pace that suits the requirements of the learner. They can be used as basic instructional materials and, also, to supplement, enrich, or extend the study of particular topics or other facets of an instructional program. They are relatively inexpensive and universally available.

Printed materials of instruction are widely used in America's schools and colleges. The supply of free textbooks in America's schools was started in 1818, and the first state free textbook law was passed by Massachusetts in 1884. In elementary and secondary schools today, 88 percent of the textbooks and related printed materials of instruction purchased are purchased with tax funds and furnished free to students. Six percent of the materials are bought by students, and six percent are purchased through rental income from students. Free textbooks and related printed materials are a significant feature of our system of free, public education, which James Bryant Conant has described as "America's greatest contribution to the forward march of civilization".

Total sales in 1963 of textbooks and related printed materials of instruction, according to the Annual Survey made by the American

Textbook Publishers Institute, were $462,750,000. Although this may appear to represent a considerable expenditure, it is actually little more than 1 percent of our total school expenditures. These sales break down by school level as follows:

Elementary, $185,200,000, or 40 percent
High School, $120,650,000, or 26 percent
College, $156,900,000, or 34 percent

Average sales per capita in dollars in 1963 and by school level were:

Elementary, $4.97
High School, $9.48
College, $28.45

The average prices by school level in 1963 were:

	Textbooks Hard-bound	Textbooks Paper-bound	Workbooks
Elementary	$2.06	$ .60	$ .565
High School	3.26	1.10	1.02
College	4.91	1.50	1.82

Educational publishing, a label that more accurately describes today's textbook publishing industry, is a highly competitive enterprise and industry. It's difficult to say how many publishers are engaged in educational publishing, among other reasons because it is getting harder and harder to draw a fine line of distinction between a textbook and a trade book.

Estimates of publishers who publish textbooks and related printed materials range up to 175 publishers. There are, however, 82 publishers who reported sales data for the 1963 ATPI Annual Textbook Survey, and these data represent well over 90 percent of the total sales volume of the industry.

Numerically, the educational publishing industry is competitive and there's not a Goliath among them. No one house does as much as 10 percent of the total industry volume.

The Vital Importance of Product Distinction in Educational Publishing

More significant than numerical or quantitative competition is qualitative competition. Every educational publisher seeks to distinguish his product functionally, editorially, and graphically. And the new and changing and growing demands of education these days -- together with improvements in book manufacturing technology -- are providing many opportunities for distinguishing printed materials of instruction functionally, editorially, and graphically.

With some exceptions, and these are usually found in the upper levels of college and university publishing, textbooks are conceived, planned, written, and produced through close collaboration between author and publisher. This joint effort includes, in addition to authors, the utilization of many specialists -- among them, educational consultants, editors, researchers, marketing specialists, designers, artists, illustrators, photographers, picture editors, production specialists, compositors, engravers, printers, and binders. The process is long and laborious. From idea to finished product may take from three to ten years. The publishing program may consist of a simple text; or a series of texts. It will probably include correlated workbooks, study guides or laboratory manuals, and objective tests. It will probably include a complement of helps and aids for the instructor. The initial investment may range from $100,000 to well over $1,000,000.

The object of this extensive and exhaustive effort is to produce a distinguished product -- a product that represents a new advance as a teaching instrument, that will make a significant contribution to our maturing educational technology and to education, that will be competitive, and that, through a series of reprints and revisions, will return the initial investment and a profit to the publisher.

Graphic excellence in textbooks and printed materials of instruction is more readily obvious than editorial excellence. But graphic excellence must serve a functional purpose; otherwise it may not be justified economically.

Editorial excellence is, of course, discernible and must be present in order for a textbook to win an adoption. The adoption of textbooks today is usually the result of well-organized, thorough analysis and evaluation of a textbook by a committee of teachers. They are primarily concerned with the editorial excellence of a book -- its aims, plan, content, organization, presentation, student projects, activities, and so on. They are concerned first and last with the qualifications of a textbook and related printed materials to achieve with optimum success the desired aims and objectives of the course or instructional program for which it is intended.

What's Ahead for Printed Instructional Materials?

1. Continued use of printed materials. Printed materials of instruction will continue to be used and used extensively. As long as people read there will be a place and a demand for printed materials of instruction. Further, there will be a continuing need in the galaxy of our educational technology for materials with the unique advantages and features offered by printed materials. The

format and the function of the materials may change, but printed materials will continue to be used effectively.

As a matter of fact, sales of textbooks and related printed materials of instruction are projected at $850,000,000 by 1970, up from $462,750,000 in 1963. In units, rather than dollars, the volume of textbooks and related printed materials is estimated for the year 1985 at 3,000,000,000 units, or approximately three times the distribution in 1960; and many experts in the field of educational publishing feel that this projection is very conservative.

These projections are based, of course, not only on the continuing place and function of printed materials of instruction in America's educational technology, but also on the anticipated increase in enrollments in America's schools and colleges. Whereas there are some 55,000,000 students enrolled in schools and colleges in the 1964-65 academic year, this enrollment is expected to exceed 80,000,000 by 1980.

2. Implementation of new learning theories -- programmed instruction. Printed materials will be used wherever suitable to implement new learning theories and other advances in educational technology. Programmed instruction is an excellent example of such implementation.

The implementation of new learning theories is achieved through dissemination of information and reports about the research that led to the theories, and this is normally done through the printed page of research and professional journals. Later, reports of demonstrations and case histories are presented, in the same types of journals as well as in newspapers and popular magazines via the printed page.

The new curriculum reforms are based on what might be considered new learning theory that attempts to teach students through induction and discovery rather than rote memorization. The work of the various curriculum committees is disseminated by the printed media and later new packages of printed materials will be made available to assist the teacher in putting these new practices into action. Although such systems may involve audio-visual materials, the emphasis is always on printed textbooks, workbooks, study-guides, laboratory manuals, and instructors' guides; all of which are printed.

One of the newest approaches to instruction is the use of systems involving materials. Where recorded and projected materials are used, printed materials remain as a basic part of the system.

In the teaching of melodic perception, Dr. James Carlsen, of the University of Connecticut, presents the course in programmed audio frames played on the tape recorder but requiring the student to also read and respond in a printed program book. The printed book requires that the student overtly respond to each of the hundreds of steps in the learning process. It tests him and directs him to review when needed and reinforces the items that have been learned.

Even in computerized instruction, printed materials are found to be a vital link in the learning process. A student at Pennsylvania State University studying statistics from a computer in the IBM Research Laboratories at Yorktown Heights, New York, refers to printed materials for information, instructions, tables, graphs, and other source content.

Programmed instruction is a development that promises to influence the editorial format of textbooks. Some probable effects include the following:

a. a sharper definition of aims and objectives;
b. a tighter structuring of subject matter;
c. more careful sequencing of presentation of content;
d. more use of "cues" to learning and reinforcement of learning.

In addition to influencing textbooks, programmed instruction per se will be offered most commonly in book form.

The Center for Programed Instruction, which is now a part of the Institute of Educational Technology at Teachers College, Columbia University, compiled and produced, in 1962 and in 1963, in cooperation with the U. S. Office of Education a guide to programmed instructional materials. According to the 1962 guide, 122 programs were available, whereas 352 programs were available in 1963.

In 1963, there was a substantial increase in the number of programs available in text or book form only. In 1962, 31.1 percent of the programs were available in text or book form only; in 1963, 56.6 percent of the programs were available in text or book form only. As a counterpart of this increase, the percentage of programs available in text form and also in a form for machine use dropped from 62.3 percent in 1962 to 23.7 percent in 1963. Thus, 80 percent of all available programs in September, 1963, as reported in the CPI bibliography, Programs, '63, were available in text form and almost 60 percent were available in text form exclusively.

Programs, '63 also revealed a trend to shorter programs. In 1962, the median length of programs was 2400 frames; in 1963, it was 1000 frames. The percentage of programs available in units or series form increased from 20 percent in 1962 to 23 percent in 1963.

The use of programmed instructional materials seems assured and promising. Probably they will find their principal use in definition work, in the exposition of information, in obtaining understanding of the structure of a discipline, and in developing skills. The sophistication of programming techniques and styles of programming is growing rapidly.

3. Growing differentiation of printed materials. The need for differentiation in purposes, content, and characteristics of textbooks and related printed materials of instruction will accentuate rapidly. There is a growing demand for differentiation in printed materials to serve individual differences. There is a growing demand for differentiation in materials to serve the proliferation of knowledge and the pursuit by individuals as well as by groups of students of special subject matter interests. There is a growing demand for differentiation of materials to serve the interests and preferences of communities.

In the years ahead, a single textbook for a particular subject and grade level will not suffice. Today, one major educational publishing house publishes eight different textbooks for ninth grade mathematics students, each designed to do a specific job.

The use of special-purpose printed instructional materials will grow rapidly. Such materials are an excellent means of serving individual differences and special subject matter interests. Hence, paperbacks and monographs, as examples, will be used even more extensively in the future, notwithstanding the substantial growth in their use in the past several years. The use of paperbacks in elementary and secondary schools in 1965 is estimated to exceed their use in 1960 by 43 percent; and the use of paperbacks in colleges in 1965 is estimated to exceed their use in 1960 by 103 percent.

It is vitally important to emphasize that special purpose paperbacks are not to be confused with paperbound basal textbooks.

Another type of special-purpose printed materials that is expected to grow substantially in the years ahead is periodical literature for classroom use. Such material is a very helpful means of providing news and other pertinent subject matter that is au courant and up-to-date.

4. Research and printed materials. There is a great deal more research behind textbooks and printed materials of instruction than is generally realized; in fact the prolonged and involved process of preparing textbooks and printed materials of instruction is essentially a research process. Nevertheless, textbooks and printed materials will be carefully and extensively researched in the years ahead. The aims and objectives sought in textbooks and related materials will become more concrete and specific, and, in many instances, will be based on behavioral analyses. Through trial and experimentation with content, presentation, format, and typography, efforts will be made to improve in every way possible the dialogue between the reader and printed material. Further, attempts to measure the results obtained with printed materials in terms of objectives sought will be refined.

It is significant that textbooks and printed materials of instruction have been included in Title VII of the National Defense Education Act, which is concerned in part with research into educational media. Research will be devoted not alone to printed materials per se but also to their use in conjunction with other types of educational media.

5. Systems development. Educational technology has developed to the point where it consists of a wide variety of component materials and media, including, in addition to printed materials of instruction, motion pictures, filmstrips, slides, transparencies, tapes, records, tape recorders, language laboratories, projectors, television, radio, teaching machines, and computers. Each of these components has unique contributions to make to instruction. When carefully selected for a purpose and effectively combined into a multi-media package or system, their contribution is greatly enhanced.

Today, educational publishers and other sources of materials and media comprising our educational technology are preparing and producing packages or groups of materials and media for particular educational purposes. For example, a publisher of a modern language program in French has produced a package or group of materials for the purpose that consists for each level of instruction a basic textbook, forty tapes, fifteen motion pictures, twenty filmstrips, records for home as well as school use, tests, and a comprehensive guide for the instructor in teaching the course and using the materials. The production of such multi-media package programs is becoming commonplace for major subjects offered in schools and colleges.

In the years ahead, the multi-media package will be advanced to a truly multi-media system. It will be carefully designed to achieve a given set of educational aims and objectives with optimum success. The aims and objectives will be carefully analyzed and established; the unique contributions of various materials and media to the achievement of those aims and objectives will be carefully assessed; then, through research and experimentation, the materials and media will be combined in the most effective way possible to achieve the aims and objectives. The net result will be not simply use of a variety of materials and media, but of a selection of materials and media used jointly in a way that will enhance the contribution of each medium to the total net result.

6. Utilization. One of the most critical needs in educational technology is adequate, enlightened, and documented assistance for instructors and administrators in the use of technology. Much of our technology is new and unfamiliar to teachers and administrators by and large. As a result, there is an indisposition to accept and use much of the technology. An effective means of obtaining acceptance and use is to provide for instructors and administrators helpful assistance with utilization. In the years ahead, one of the primary objectives of educational publishers and other sources of instructional materials and media will be to obtain and provide, on the basis of experience and research, such assistance. Not only will this be a factor in obtaining acceptance and use of educational technology, but it will be an indispensable factor in achieving the results for which the technology is designed and which education must aspire to obtain.

Summary

Educational publishers have a growing commitment to all levels of education. Materials that are published on one level, be it elementary, high school or college, have a bearing on materials published for other levels.

Educational publishers have a growing commitment to all instructional materials and media; in fact, the day of the textbook publisher per se has come to a close. He is, as he must be, if he would grow and prosper through service to the growing enterprise of education in America, an educational publisher, embracing all types of materials and media in education.

Finally, educational publishers have a commitment that goes far beyond that of employing the technology of printing and binding in the manufacture of textbooks and related materials and, then, promoting and selling them to schools and colleges. They have a commitment as entrepreneurs to build into their materials the most productive, effective instructional service that can be created and devised; and to obtain, then, the most effective productive utilization of that instructional service. This is their all-embracing commitment.

3. OPENING SESSION

3.1. Welcoming Remarks

The conferees were welcomed by Dr. Paul Van Bodegraven, on behalf of the MENC, and by Dr. Harold Arberg, on behalf of the U. S. Office of Education.

Dr. Van Bodegraven: This is a "first" Conference, I believe, on educational media and their uses in the teaching of music. There are bound to be some fumblings in a first conference, but we must make a start. One implication that we would draw from this is that we will have further conferences of this type. I am sure that those of you who are here, who have been invited to attend this as representatives of your state, are conscious of the real privilege that it is to attend the first of such conferences. What we are going to try to do, as time progresses, is to **impress** you as well with your obligations. We will emphasize that it is your obligation to take back to your state, and to use in the most effective manner, the information that you get here in the next five days.

Musicians have a certain feeling about machines, and we certainly are going to deal with some machines in this Conference. In spite of the fact that we have used machines, we may not think of the phonograph as a machine but it is now listed among the educational media. We have also used in instrumental teaching, in particular, the stroboconn and the strobo-tuner, and I think it is safe to say that these instruments have contributed more toward the improvement of a specific phase of performance, that of intonation, than any other single thing.

Nonetheless, musicians do have a particular attitude toward machines. First of all, some of us expect the machine to solve all of the problems we haven't been able to solve. This is kind of a tall order, and somewhat wishful thinking, although they certainly should be of value to us. Another attitude that I have encountered in my college faculty is that we view machines with a certain amount of awe and distrust for a variety of reasons, one of them being that some of us are not known for our mechanical aptitude. Now if you happen to be in this category, possibly you can concentrate a little bit more, in these five days, on the learning theories which led to the development of the machines that have now been produced.

We have accepted in this life of ours certain inevitabilities. We've accepted the inevitability of death, although we seem to be suggesting postponement a little longer each year. There is another inevitability that we face in teaching: the inevitability and tyranny of the 24-hour day. We've been particularly aware of this 24-hour day, and its limitations, since Sputnik, and the inevitable slicing of the day into various sizes. It seems to me that a Conference such as this is necessary if for no other reason than because it is unrealistic for us to believe, that in most instances, we are going to be given a much larger slice of the 24-hour day than we now receive. Therefore, our salvation will almost have to depend on making more efficient use of the time now available.

I wish for you a very stimulating, interesting and profitable week.

This morning, Dr. Arberg is also here to bring you greetings. Dr. Arberg is one of the more recent additions to the staff of the United

States Office of Education, and we in music education, I believe, are particularly fortunate that he has not only an interest in music education, which is important, but also an understanding of the problems of music education.

Dr. Arberg: I didn't realize until I heard this audience settle this morning, as the chairman called for order, how closely an audience resembles a symphony orchestra, and how a speaker feels like a conductor. But as you talked, and then the hush came over the hall, there was a great feeling of expectancy on your faces. I hope it remains there throughout the five days. There is certainly a great feeling of expectancy on my part and on the part of the U. S. Office of Education. We look forward to greeting you officially, the Commissioner and others of our staff, when you join us Wednesday morning, over in the Demonstration Center.

For my part this morning, I would like to keep it quite brief (because the banquet of inspiration and information is soon to come) and simply say that the U. S. Office of Education is concerned with helping to improve and strengthen music education, and this Conference is evidence of that concern. As musicians, I think we must certainly take advantage of a national concern for all of the arts. It is true that this concern was first felt for the sciences. A moment ago, Dr. Van Bodegraven mentioned Sputnik, and if we really wanted to find the originator of this Conference, we'd have to point to Sputnik, because it was that phenomenon, you will recall, which spurred our Congress into legislating the National Defense Education Act, and it is under the provisions of Title VII of this Act that all of us are privileged to come together here in Washington for the first national conference dealing with media in music education.

May I say that the Office of Education is endeavoring to work in three particular ways, or with three distinct groups, all of which are represented by you who are attending this Conference.

The first is the professional organization. In the field of music education, the organization is the Music Educators National Conference, the host and administrator for this Conference. We have and we certainly plan to continue to work very closely with your national organization, and with your divisional organizations as well.

The second relationship that the Office of Education maintains (and I hope we can strengthen and reaffirm this relationship in our music programs) is the relationship between the Federal Office of Education and State Departments of Education. And the State Departments are represented here by the State Supervisors of Music, of whom we now have 23. The federal-state relationship is an important one to us.

And thirdly, there is the relationship between the Federal Office of Education and the individual music educator and his local or state music education association.

We want you to know that we exist to work with you. We hope that we can help stimulate ideas from you and we certainly hope to reflect back to you a cooperative and optimistic attitude in the development of music projects.

So I think this Conference is a good example of these three relationships between the Federal Office of Education and yourselves, in whatever capacity you may be serving.

But right now, I am as eager as you are to hear our Keynote Speaker. Thank you for this opportunity to welcome you this morning to the first

National Conference on the Uses of Educational Media in the Teaching of Music.

3.2. The Keynote Speech

The Keynote Speaker was introduced by the Conference Director, who noted that Dr. Fuller's keen insight into creativity was not limited to thought or talk, but that he successfully translates his creativity into concrete terms, examples of which may be found in many places, the world-around; as music educators vitally interested in creativity, we welcomed the opportunity to hear one of the most creative individuals of our time.

Dr. Fuller: I'm very grateful for that introduction. I myself have pondered a great deal on the word "creativity," and I'm not inclined to use it in respect to human beings, because my own feeling as an explorer in events, behaviors, mathematics, and physical phenomena in general is that what is usually spoken of as creativity is really a unique and unprecedented combination in the use of principles which exist a priori in the universe. I think the word "creation" implies adding something to the universe. And I don't think man adds to the universe. I think man is a very extraordinary part of the universe for he demonstrates the unique capability to discover and intellectually identify abstract, operative principles of universe -- which though unconsciously employed have not been differentiated, isolated and understood before, as being principles, by other biological species. Rejecting the word "creativity" for use by any other than the great intellectual integrity progressively disclosed as conceiving both comprehensively and anticipatorily the complex interpatternings of reciprocal and transformative freedoms which apparently govern universe I go along with the 5,000 year old philosophy of the Bhagavad-Gita which says "Action is the product of the qualities inherent in nature. It is only the ignorant man who, misled by personal egotism, says: 'I am the doer." I am most impressed with the earliest recorded philosophic statements by unknown individuals of India and China. These earliest philosophies became progressively compromised and complicated throughout ensuing milleniums.

In your introduction of me, reference was made to machines which reference discloses the general apprehension of people in the world of music -- shared by many outside the field of music. With respect to machines I feel it important to recognize that we, ourselves, physically speaking, are machines. All of our musical instruments are machines. The physical universe is a machine -- in fact, the minimum and only perpetual motion machine. What people are usually apprehensive about is the unfamiliar machine... Yesterday's horses were frightened by automobiles. When humans see an unfamiliar black box, batteries and a red button with wires leading under their house, they are justifiably apprehensive. I think man is very properly concerned about that which he does not understand. I don't think that it is the machine per se that bothers man; it is just not understanding -- anything -- that disturbs him. When an accident bares portions of human organs -- familiar only to doctors -- those organs look foreign and frightening to people. Stick your tongue way out before a mirror. It is a strange device. At outset of the industrial era it was often said that everything would soon be stereotyped; that variety in life would diminish. In the era of man's accomplished flight the acceleration in design diversity of flying machines has out-stripped all living specie evolution in rate of increase of novel forms most of which have been magnificently reinspiring of man's imagination. Except for *paint* the design science evolution of aircraft has been entirely functional and devoid of aesthetical motivation yet inadvertently powerful in aesthetical effects induced in the functionally illiterate public.

I feel a great necessity to explain why I am here with you in the world of music. Though I love music, I haven't any professional warrant to be here. I am an explorer in what we call generalized design science principles. And I would like to clear up what I mean by that. The word "generalization" as used in the *literary* sense means "very broad." It suggests trying to cover too much territory -- too thinly -- to be sound. The literary men say "this is too general." In the mathematical sense the meaning of generalization is quite different. The mathematician or the physicist looks for principles which are persistently operative in nature, which will hold true in every special case. If you can find principles that hold true in every case, then you have discovered what the scientist calls a generalized principle. The conscious detection of generalized principles which hold true under all conditions and their abstraction from any and all special case experiences of the principles may be unique to humans. By abstraction I mean an idealized, empty set statement such as one of my own, "Tension and compression are only coexistent" -- when you tense a rope its girth contracts -- ergo compresses. It is conceivable that a dog tugging at its leash at one time and compressing his teeth into a bone at another time should formulate consciously the generalized "only-coexistence of tension and compression" though the dog is spontaneously and subconsciously deft in tension compression tactical moves. I am certain that what we speak of as human morality is a form of tentative generalization of experiences. Man has also the unique ability to employ generalized principles -- once recognized -- in a *consciously selective* variety of special case interrelationships. I am quite confident that many generalized principles also have their special case realizations in the world of music. Phythagoras' discovery of the law of octaves obtained by halving tensed strings and of major and minor mode key progressions of fifth notes, obtained by trisectional fret-stops applied to firmly tensed strings or dried gut sinews, was an extraordinary instance of generalization. I have discovered generalizations operative in other special case areas than that of music which may have special case occurrence in music. It is my familiarity with generalized principles that must per se permeate music as well as other areas that permits me as a *generalist* to speak to you as musical education *specialists*.

Most importantly, I would like to say to you as I stand up to talk, that I don't have a prepared talk. I never allow myself to prepare talks, because I've learned that it is perfectly possible to think out loud and I know that if somebody comes to speak to me and pulls a paper out of his pocket and starts to read me a speech, I say "Let me have that. I can read it more rapidly than you can." I don't think that so-called prepared speeches are anywhere nearly as effective, in exploratory communication between us, as spontaneous *thinking out loud*. Whatever preparation I have must come realistically from my whole life and not just from a few hours of special case collecting and putting together of notes.

My strongest feeling about meeting with you relates to the fact that I think the musicians in contrast to the scientists are extraordinarily intimate with their own theory. I'm going to make clear what I mean by that by talking about the scientists. The Massachusetts Institute of

Technology's Faculty Club have quarterly speakers. I was their winter-quarter speaker of 1950. I stood up -- and because I hadn't prepared anything -- found myself thinking outloud -- something that surprised me very much. I said that I was surprised to be invited to speak to them because they were all so ignorant. They looked astonished, and I was a little astonished myself. So I had to explain why I thought they were ignorant. And I said that all of them as scientists, on leaving MIT, went home to their families, and on a beautiful summer afternoon or early evening, at a picnic, said to their wives, or daughters, or sweethearts, "Darling, look at that beautiful sunset." And all the scientists realistically saw and as yet "see" the sun setting -- "going down." I wouldn't think much about this "seeing" of the sun "setting" by a taxi driver or other layman, but, said, "As scientists, you have had 500 years since Copernicus and Galileo to get your senses in gear with your own theory -- with your own experimentally-proven information. You know that the sun is not setting. You know that the earth is revolving to obscure the sun, but you 'see' the sun 'set.' Because it is taking you more than 500 years to get mentally -- reflexively -- in gear with your own theory it must be because you don't know how and probably haven't even tried, therefore I think that you are fundamentally ignorant; particularly because of experiments I have made with children.". I've used a free Earth sphere and a small spotlight fixed on a stand ten feet away in a dark room. The spotlight represents the sun. One side of the Earth globe is lit -- the other is in shadow. I've explained to very young children who haven't been given the word "sunset" too often that the earth is revolving to obscure the sun. I glue the soles of the feet of figures of the children to the part of the world globe where they are then standing and revolve the globe eastwardly. The children's figures are revolved out of the "sun" light, with increasingly long shadows until they are in the deep night as on around the globe goes through night to morning as the long shadows shrink as they come once more into the minimum shadow of noon. I then take them onto a high point of land, with wide horizons at dusk, I have them face north with their feet wide apart and I ask them to consider our enormous sphere revolving as they watch the sun out of the corner of their left eye and they say they "feel" it rotating them around out of line of sight with the sun. Driving due west on a super-highway at 70 m.p.h. in late afternoon with the sun in your eyes you explain to the children that the earth's surface like a phonograph record's outer rim revolves faster at the equator than near the poles and that in mid-U.S.A. the surface is revolving eastward, away from the sun, at 860 m.p.h., which means that we are running a losing race to keep the sun in sight and the children excitedly see, and so do you, the extraordinary speed of eastward revolution of the earth speeding by the car as we get swept back eastward at 790 m.p.h. Thenceforward the children "see" the earth-sun relationship that way. That is reflex conditioning. There is often an additional special blockage that hinders grown people regarding sun relationships which is the poetical sound of

grown people regarding sun relationships which is the poetical sound of

"sunset." No one has invented a more poetical single word to express being revolved out of sight of the sun. Which way we see often depends on what you are told at the outset of life before you subconsciously lock together your subconsciously spontaneous reflexings.

I found it possible at 40 years of age to correct my erroneous sunset reflexes. It took much time, however. Therefore I know that we can say that it is not impossible to recondition our adult reflexes, but the later, the more difficult. I find that the scientists are experimentally remiss in continuing to yield to feelings that do not agree with their theories. They have failed, because of ignorance or laziness or fear of being "different," to bring whatever they have learned of the universe into correct conceptual realizations by the child. They haven't taken the trouble to test the theory they have acquired, so they carelessly continue to misinform the children. They are apparently ignorant of the fact that the child can most easily learn to see things correctly only if he is spoken to intelligently right from the beginning. Intelligently means thinking such situations through to discover the need for experimental preciseness plus the disciplining of self so to do. I don't think it is scientific of the scientists in the educational processes to let these matters ride, and to go on debilitating a whole new generation of a billion young who if geared up sensorially with correct theory might have sense enough to make the world work.

I note that scientists also use the words "up" and "down" hundreds of times daily. So I asked the MIT faculty if any of them could tell me what part of the universe is "up." Are the people in China upside down? Those words "up" and "down" are derived from the milleniums in which man thought erroneously of his universe as an horizontal island

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as -- "the four corners of the Earth" -- and as the "wide, wide world" -- in an infinite horizontal ocean with an obvious "up" and "down" set of perpendiculars to his flat plane -- Heaven up and Hell down. Though as yet difficult to purge from yesterday's reflex conditioned flat earth concepts and speech, to man far out in universe the sphericity of Earth becomes evident and "up" and "down" soon become obviously, feelably meaningless. But clipper ship captains of the last century sailing their ships around the world and the aviators flying planes around to China in this century discovered that they didn't have to turn their ships upside down when they reached China. Aviators have discarded the words "up" and "down." Now they come "in" for landings and they go "out." Astronauts come "in" with respect to various bodies in the universe and they go "out" from them. In is individually unique in direction toward the center of any one system -- but "out" is common to them all. There is no shape of space -- there is only omnidirectional "out" and the specifically directioned "ins." As there is no meaning to the words "up" and "down" I said to the MIT faculty, "I think that you scientists are again demonstrating ignorance in not being able to purge your own language of scientifically faulty words and concepts. When the Jet Propulsion Laboratory's scientists of California reported to the world over radio and television of the first successful U.S.A. rocket-launched satellite's accomplishment of orbit they constantly used "up" to describe its outbound flight."

I went on to say to the MIT faculty: "As scientists, you tell me that the wind is blowing from the northwest, which infers that you can really blow air great distances and that there is some place called northwest -- which, of course, there isn't." Air can't be blown great

northwest -- which, of course, there isn't." Air can't be blown great

distances. It curves back upon itself in evoluting-involuting doughnut shaped ring clouds -- from the tobacco smoke-ring size to the atomic bomb's mushroom-ring size. An electric fan at the front door cannot push air through all the rooms of the house, but it can pull air through all the windows and through the rooms around corners and out through the front door. Whereas pushed air cannot travel great distances, pulled air tries to straighten out and can be pulled over enormous distances. What the scientists really mean when they said it is blowing from the northwest is that there is a low pressure to the southeast of us which is sucking the air from all directions and pulling it by us -- who happen to be northwestward of the low pressure center. So why don't the scientists say "a low pressure southeast of us is sucking." Or simpler yet "southeast's sucking."

At any rate, I was able to get the MIT scientists to laugh at themselves, realizing that they were indeed quite reflexedly "ignorant." They are as yet ignorant because they don't know as yet by experimentally proven means how to gear many of their theories in with their senses. How can they make sense if their senses deny their theory. They try to find excuse by saying that science now deals primarily with sub-visible, sub-audible, sub-smallable, and sub-touchable phenomena. We answer that through generalized principles which being abstract are independent of size it is possible to make special case models at sensorial sizes, of all the phenomena.

Now I'd say that my feeling about musicians is that they do gear their senses realistically with their theory. And I have a feeling that in music, man may be able to deal with the new life much more effectively than science has been dealing with the new-born life. All phenomena are generalizeable into frequency language and music provides sensorial range frequency modeling. This meeting is being indirectly aided by the National Science Foundation's educational effort. I think that it is important for us to look a bit at the great attempt of science to enormously expand its capabilities through organized educational activity.

Fifteen years ago, our country had great need to discover how to produce scientists. Suptnik, only seven years ago, accelerated the effort to solve the abundance-of-scientists problem. In order to know how to produce scientists the Academy of Sciences and the National Science Foundation said, "Let's look at the record. How have we produced scientists?" There is in Washington a roster of all the scientific societies in the United States and of all the members of those societies. The vital data on all the different scientists in the United States is filed in Washington on punch cards which contain extraordinary ramifications of information concerning the lives and the educational preparations of those individual professional scientists. From this data it was possible to get answers as to the development of the front-rank U.S.A. scientists. The committee of scientists working on this question first established their criteria of what constituted a front-rank scientist. They said he must have a Ph.D. He had to have made highly accredited original contributions to knowledge. He must have published his work in copious manner. Having set up the criteria, they were then able to ask the punch card, data-storage system to come up with the names of all the scientists in the United States who qualified under their front-rank-scientist criteria. Up came a set of cards with actual names and case histories of the individuals. Possibly the most startling news for those who read this data was the fact that the top scientists of the United States had not been educated in scientific establishments. The Massachusetts Institute of Technology and the California Institute of Technology were not in the first 20 of the educational institutions from which the best scientists had come. It was found that front-rank scientists had come predominantly from small liberal arts colleges. The committee went on to inquire of the scientists individually, as to what they themselves attributed their successful development. This inquiry brought out that the majority of "front-rankers" felt that the most important factor in their lives was that they had been students of a great and inspiring teacher. Front-rank scientist success was clearly attributable to small colleges and intimate, personal equation factors of an inspiring teacher. The key was individualism at its intellectual best. Russians please take note!

Before coming to meet with you, I read the notes of those who are going to speak -- they were all more obliging than I was -- and learned their views on the subject of our meeting itself, the new technology and its aid to the educational processes -- in (the special case of) the field of music. Because none of the others are to mention it, I think it's very important for us to recognize right away that if a great teacher is of the essence, then it is also very much in evidence that great personalities can come over television and moving picture documentaries. Children and young people by the multi-millions fall in love with moving picture actors and actresses. Their personality comes through despite their having been seen only as a complex of flickering light and shadows, on a blank wall. It is quite clear that personality can "come through" the machine. Listen to and look at Pablo Casals playing in Robert Snyder's documentary of Casals during his self-exile in Prade, France. Inasmuch as the great teacher personality is one of the great factors of education success, I would say that we are not faced with insurmountable trouble by the machines -- quite the contrary. We can attain greater intimacy with the nuances of facial expressions and bodily motions of great personalities with the blown-up screen projections than can be experienced by students in back rows of concert and lecture halls. I think it obvious that we can bring great personalities -- (who could not possibly meet face-to-face with millions of students seated in stiff chairs in crowded classrooms) -- to hundreds of millions of young people listening and viewing undistractedly in their homes, by use of well-developed TV documentaries. Children sitting comfortably at home seem annoyingly undiscipled to the busybodies of yester-year, who want each generation to have to take what they themselves took. But discipline is exclusively from within self and most effective when spontaneously initiated. I have photographed the eyes of my grandchildren -- all unnoticed by them as they were fixed upon the TV with the same utter preoccupation of a baby at it's mother's teat. Second-hand TV antennae are everwhere seen in the world's worse slums. The pipelines for great teachers to reach the eager brains of the billions already exist.

Now I would like to think a little bit more about scientific theory and sensorial reality. I am going to work gradually toward generalizations of the various principles that I think may interest you in relation to problems of music teaching. Not only do I find that the scientists at MIT -- and everywhere else around the world -- are out of gear with their own theory (as once was I to far worse degree), but I find also by actual experience, that many if not most of the axioms of our would-be simplest geometry and arithmetic are faulty. Axioms are defined by Webster as "statements which need no proof because their truth is obvious." Because taken erroneously as obvious (as with the sun "setting"), mathematicians deliberately side step the experimentally developed basis of all physical science. Much of the mathematics deal with phenomena which could hold true only if their axioms are experimentally valid. Because experiment invalidates many of the axioms such as the existence of solids, continuous surfaces, straight lines, etc., much of the mathematical educational curricular sanctioned by mathematicians, adopted by school boards, and taught in all elementary schools is false, irrelevant, discouraging and debilitating to the children's brain functioning. Science allows this debilitating practice to go on. Sense illiterate, scientists haven't taken the trouble to find out how to stop each generation from going on to give the next one what the preceding generation had been told was "good for them". Obviously one of the reasons why scientific education has seemed too difficult for many is the fact that much of its mathematics is founded upon experimentally unprovable myths which must greatly offend the intuitive sensitivity of the lucidly thinking new life. I find it shocking that I can recite to you many mathematical fallacies that we may go on teaching for another decade to ruin the extraordinary learning potential of another whole generation. All of this mischief of irresponsibility of the so-called grown ups will have to be undone, probably at painful cost to world society, quite possibly at total cost. We don't have much time to gear our senses with reality, thereby to gain universally spontaneous and cooperative action in tuning up man's competence to save himself.

What should have been a socially shocking statement -- but wasn't, in fact went socially unnoticed) -- had to be made during World War II, by some of the few great scientists. These scientists said in the early 1940s that when a young man demonstrated extraordinary capability in the sciences, at the university graduate student level, and it was thought that he might be developed further to become a great scientist, it meant that eventually he had to be assigned to work with an already demonstrated great scientist, and the time of that very great scientist was of such extraordinary value that the great one must not be impeded by a young man who was not going to be worth the risk of wasting the proven great-one's time. The greatest test that they had to apply to the promising bright ones was the one which would discover whether the candidate had the intellectual fortitude to withstand unlearning everything he had learned, because that was what he was going to have to do in order to become an importantly effective modern scientist. This was occasioned by the proven greats' discovering that approximately everything that science had thought to be validly operative, up to 1932, was discovered to be no longer valid. Science had to start all over again. (See the 1942 farewell address of the outgoing president of the American Association for the Advancement of Science.)

Since 1932 mathematical-physicists, physicists, chemists and many other scientists have been through one house cleaning after another. In contradistinction so-called "pure" mathematics and all of the branches of the "pure" variety that permeate academic disciplining, on the pretext that it is pure -- ergo transcendental to applied or experimental reality -- has failed to purge itself of its unproven axiomatic conceptions -- adopted almost entirely in the milleniums before present experimental science began to alter man's comprehensive ecology and cognitive capabilities. The axioms, which start with the "obvious" -- the superficially deceptive appearance of "nature" in the pre-microscope or telescope era of extension of man's sight and induced a prodigious and now invalid vocabulary have never been subjected to rigorously conducted scientific experiment. Despite that the vast majority of pure mathematicians will disagree with me violently and may call me unbecoming names for so stating, I dare to suggest to you that (excepting completely the mathematical-physicists) the revolution about to take place in mathematics will be amongst history's most violent academic reforms. You will not have long to wait to discover that I am right. Pride, fear, economic and social insecurity and the general inability of humanity to let go of nonsense in order vastly to re-organize ourselves is of the essence. Therefore, I would say that speaking of educational tools and instruments, that the tools are going to make it easier for the new life to discover experimentally what really is going on in nature so that the young will not have to go on taking so much nonsense on experimentally unverified axiomatic faith. The revolution will come when the tools disclose the nonsense and axiomatic invalidities to the rising generation.

Now, I'd like to mention an individual and his experimental work that has been recently and deservedly much discussed. I speak of Dr. Benjamin Bloom and his book on Stability and Change in Human Characteristics -- Wiley & Sons, publishers. His book reviews effectively a number of case histories of individuals from birth up to the university graduate-student years, approximately the first 26 years of life. The studies have been made in relation to periodically administered and uniform IQ tests. I am going to talk about these case histories of Dr. Bloom's in the light of other scientific explorations, for instance the explorations that are being made by the neuro-physiologists, exploring the human brain with electrodes and thus discovering many important electrical wave patterns. Gradually a number of patterns in the brain have been positionally identified with respect to specific cell groups, as related also to specific types of thought, expressions and actions of individuals. Through this physiological exploration a great deal is now known of the patterning of brain events and functions. Apparently we start life with a given total brain cell capacity, component areas of which are progressively employed in a series of events which are initiated entirely in the brain of the individual by pre-set chromosomic "alarm clocks". Put your finger in the palm of a newborn baby's hand and the baby will close its tiny hand deftly around your finger. If you try to withdraw your finger, the baby's hand responds instantly to the withdrawal tension which you exert and it opens its hand. Their tactile apprehending organism is apparently operative in superb coordination at birth. Days later the "alarm clock" sets hearing in operation. Days later the babies "see" for the first time. One by one the alarm clock mechanisms inaugurate use of the child's vast inventory of intercoordinate capabilities and faculties. The child is not in fact taught and cannot be taught by others to inaugurate any of these capabilities. He teaches himself -- IF GIVEN THE CHANCE -- at the RIGHT TIME. Parents, as you know, have for eons thought that they were going to have to teach their children how to develop, function by function -- to walk and to talk -- but gradually it has been discovered that was not the case. Now, we are in a much more up-to-date phase of humanity on earth. We're beginning to know a little bit about the child's extraordinary capabilities. What you can get from Dr. Bloom and the neurologists is the information that the set of "alarm clocks" that go off by the time a child is four years old, govern 50% of the total capacity of the child to improve his IQ at any later date. If not properly attended to and given the chance to function, despite the brain's alarm clock inauguration of progressive capabilities in those first four years, the brain mechanisms can be frustrated and can shut off the valves of those specific capacity and capabilities to learn, then or later on, in the specific areas. The capabilities need not necessarily be employed to important degree immediately after inception, but must upon inception be put in use and kept in use as active tools in the human coordinating capability else they will squelch themselves, i.e., "shut themselves off" -- not necessarily irreparably, but usually so.

The next 30% of the total capacity of children to learn has been put into action by the time they are eight. Thus 80% of the total capability to self improve IQ capability thereafter has been put in operation by eight. By 13, 92% of the total capability has been self-started into usability. Between the years 13 and 17 the final eight percent of the total capacity to coordinate and apprehend; to comprehend and teleologically employ the input data, has been brought into operation. From 17 on, the most the young people can possibly do is to conserve the 100% capacity to further improve their IQ. We'll take those figures and plot a curve of the rate of inauguration of the capacity to learn, starting the curve at zero years and plotting 50% of the capacity by four, another 30% by eight; another 12% by 13, and the final 8% by 17. Next we plot the curve of state and federal funds in aid of education as applied at those same age levels. We find that somewhere around 3 billion Federal and State dollars a year are applied to the "higher education" period from 17 years onward, while approximately no government dollars are applied to help the 0 - 8 years period when 80% of the critical educational capacity is being established which if not properly set in use and kept in use will be closed off. The great bulk of government educational funds is being applied "after the horse has fled the barn." There was a little cartoon received with the papers about our Conference -- a picture of the teacher, and a problem of multiplication chalked in white on the blackboard; along came the supervisor and gave the teacher a machine, an audio-visual aid, which projected the same multiplication problem in black figures upon a white screen -- a new tool but no difference in technique.

I have what ought to be a surprising, even startling thing to say, which is that inasmuch as the period of greatest educational capability development is before 4 years old, the home is the primary schoolhouse -- and kindergarten is the high school. Dr. Bloom makes this clear.

Given an adequate set of variable factors characterizing the environmental conditions experienced by a human individual from birth to seventeen years, Dr. Bloom can tell you within 1% what the individual's IQ will be at 17 years of age.

Human babies are born helpless, and stay helpless longer than the babies of any other biological species. If, up to 4 years old, that young life has experiences leading to its mistrust of the competence and spontaneous inclination of the older life to look out for it, there is a breach of basic trust, its parents have a certified school drop-out on their hands. Nothing that I say is meant to tell you that the individuals whose spontaneous employment of their innate capabilities has been curtailed or abandoned, due to childhood frustrations, cannot later on "find" themselves. Determined and reinspired individuals have occasionally found ways of reopening their abandoned cortexial faculties.

Besides trust, there are two other conditions of critically controlling importance during the first 4 years: (a) autonomy and (b) initiative. The new life has to have an area that is really its own. All life tends to guard its minimum regenerative territory. This is apparently a basic ecological requirement of all living species. The child needs a minimum "territory" that is its own -- its own room if possible -- at least its own bed. This is its autonomy.

The third prime factor affecting the one-to-four year old is initiative, which must not be frustrated when it starts making experiments.

The child may want to experiment with gravity and inertia by just knocking things off tables -- this gives him basic information. He must be able to make many such experiments in order to learn about the way the universe works. The child must have experiences which indicate the coherence of materials and things. What can he trust when he has to grab something to stop his fall? To find out he needs to tear many things apart. Newspapers need only be torn a few times to show that newspapers give poor tensional support. Looking for adequate tensional coherence, the child will soon want to pull good velums or silks apart. Children musn't be stopped thoughtlessly as they go through their basic explorations, by virtue of which in due course they are going to start putting things together. They must take everything apart first and then learn how to put things together. Thus they learn to coordinate spontaneously. If parents break up that exploratory initiative by too many "don'ts" or punishments, or by having things in the child's environment that are dangerous and by which the child gets hurt so frequently as to discourage its further exploratory initiative, then that child will probably be an early school "drop-out."

In the 4 to 8 years period of child development, something comes in that is in a sense close to music which governs the ability to improve IQ during those three critical years. The most important factor is the speech pattern of the parents. If the parents take the trouble to speak clearly, to use their language effectively, to look for the better words, the children are inspired to do likewise. If the parents' tones of voice are hopeful, thoughtful, tolerant, harmonious again the children are inspired to think and speak likewise. If the parents are not parroting somebody else, but are quite clearly trying to think and are trying to express themselves, nothing encourages more the intuitions of the young life to commit itself not only to further exploration but to deal competently in coordinating its innate faculties. However, if the parents indicate that they are not really trying, or worse, relapse into slang cliches, slurred mouthings, blasphemy, anger, fear, intolerance indicating an inferiority complex which assumes an inability of self to attain understanding by others, then the 4 - 8 year-older becomes discouraged about his own capability to understand or to be understood. If the proper books are on the family shelves, if there are things around the house that make it clear to the child that the parents are really trying to educate themselves, then the children's confidence in family is excited and the children too try to engender the parents' confidence in their -- the children's -- capabilities.

We witness then that the children intuitively differentiate between parents who try to employ their minds and brains instead of relying only upon their muscles, cunning or deception in the struggle to survive. The children who intuit that their parents have chosen to use mind over matter (of course unconsciously and without formulating such words) are inspired to employ their best innate faculties to highest effectiveness and most spontaneous coordination of the factors favorable to success.

I've just come from Caracas, Venezuela, a very beautiful city of 2 million inhabitants. We don't have many cities in the United States of that size and none more beautiful. We have heard much about bombings and political troubles in Venezuela. The beauty of the scene at first belies the reputation. You also have heard much of the petroleum generated wealth of Venezuela and its capital city Caracas. From the Carribean port of Caracas you climb ay automobile through tunnels in the mountains to enter a high and beautiful inland valley in which the city of Caracas is situated. The city runs about 15 miles along the 3000 foot altitude valley bottom between two winding mountain walls rising on either side another 3000 feet above sea level. They are green growth covered mountain walls. There are no snow peaks on them. Clouds frequently hang lacily along the mountain tops. The clouds sprinkly frequently enough to maintain lush growth everywhere. A river bed winds through the valley intertwining with sculptured ribbons of expressways. Year-in, year-out, and the year around, the temperature ranges only between seventy and seventy-five degrees Farenheit.

The Caracan rich have had enough money to build extraordinarily modern office buildings, apartment houses, hotels, universities, hospitals, and expensive residences. A few rich homes are on the hillsides.

In most cities, the slums run horizontally out behind, and are hidden by, the larger buildings. But with the opulent buildings of Caracas filling the entire valley floor, the only place left for the slum blight to spread was onto the rising slopes of its flanking mountains. In Caracas you can see the slums all along the hills. With the shacks constructed of the rubble and leftovers of yesterday's changing materials the different slum areas draped over the lower mountainsides have the color effects of patchwork quilts. They make a deep impression. They disclose the large proportion of poverty as yet unbenefited by the energy wealth released by Venezuela's petroleum. I was asked to meet with educators there in Caracas; much of my meeting was with the university students and those successful citizens who thoughtfully and wisely take responsibility for the general advancement of public education. First telling the Caracans of Dr. Bloom's findings regarding environmental effects on IQ capabilities I pointed out to them that the "real school houses" are the homes in the slums right there on the hillsides. None of the slum shacks have running water. There are no sewer lines and no bathrooms or inside toilets. Getting sanitary waste disposal and bathrooms into those slums would up the IQ capabilities 50% in a short space of time. A bathroom isn't just a piece of machinery. It is intimate to the fundamental routine of cleanliness, morality and clean thinking. The ability to cope with filth-bred fungi bacteria and their ravaging, through sanitary waste disposal and ready-to=hand soap and running water, has many subconsciously important relationships to the scheduled inaugurations of the progressive cerebral capabilities of the new life as disclosed by Dr. Bloom and his colleagues. Whether the older life really wants more life and whether the environment manifests that the older life is going to try to make its arrangements to foster life more adequately deeply effects the "unfolding flowers" of the cortexial "gardens." There are a million people sitting on those Caracas hillsides who are looking right at all that modern plumbing in the valley and the bombs of resentment explode first in their hearts over their incapability to adequately foster their children. Bombs going off in Venezuela are all to do with this. Of course illiterates are easy to incite into political revolution. But after the revolution there are no more sanitary facilities. So revolutions follow revolutions with never a sanitary gain.

Despite the poverty of those slums, they bristle with the TV antennas. Secondhand TVs are connectable with civilization by wireless. Secondhand plumbing needs billion dollar water and sewer line developments -- and hillsides double the time and cost. In all the slums of the world, the TV antennas bristle. There is therefore a wireless hook-up directly to the mothers and children who watch their TVs avidly. Whatever comes over the TV to the children and parents is the essence of education for better or worse. Television is the great educational medium. It is the #1 potential emancipator from ignorance and economic disadvantage of the entire human family's residual poverty stricken 60%. I pointed out to the Caracans that their educational problems would not be solved in their universities but through sanitation in their slums and through educational TV advancements of high order.

The little red school house was a worthy conception of our forefathers. The older life always identified education with higher possibilities of economic and cultural success. Wanting their young life to have a better break of fortune than they -- the parents -- had experienced, they put their children on highest priority in the communal mandates upon their political leaders. Thus EDUCATION has become the most obviously acceptable political objective. Politicians who set about to get high educational facilities for their constituents were most likely to succeed. Thus the educational system has become a political football. The enormous appropriations for education however go primarily into building programs, i.e., on a "millions" for buildings and a "thousands" for the teachers basis, i.e., approximately 10 for the buildings and 1 for the teachers. In fact, education is a good way for politicians to keep the construction business going in bad times. So the construction business lobbies for education. The construction industry is the political pay-off system of least visible corruption. The great Appalacian poverty program has turned out in the end to be only a road contract bonanza for that branch of the construction industry. We don't need more brick. We don't need more Georgian architecture symbols. We need more wholesomely attractive and efficient sanitary facilities and superbly conceived TV educational documentaries. Early schools, with few to educate, had only one teacher. Teachers were scarce because even public literacy was minuscule. It seemed appropriate to bring all the children together in one place to hear that rare individual -- a teacher. It was nice for the mother to be able to have the children out of the house for a little bit in order to have a chance to get the house clean. This did not mean that she did not love her children -- but it was very nice to get them out for a while. There was therefore a babysitting function of the school. But mothers didn't like to say that it was babysitting, because they didn't want to seem to be getting something for nothing so they called it school. It also seemed desirable for the children to have social experience which the walk or ride to and from school and the children's proximity -- drilling and playing together -- provided. However the least favorable environment for study is a school room and closely placed desk prisons. Dr. Einstein did not sit in the middle of Grand Central Station in order best to study math and physics. He went into seclusion to study as does any logical human -- in his private study or laboratory. Let's return to Bloom's basic proclivities of the new life. The child wants his autonomy. The maturing student wants his privacy -- his special place. We have learned by experimental work in education at Southern Illinois University of the IQ capability favoring that is attainable with a little individual, private room-booth with a windowed door which "belonged" to each student. When he first entered he found in his private "room" all kinds of desirable items. He had his own telephone directly and privately connected to his teacher. He found a good dictionary; wall charts of the periodic table of the elements; a world globe; a wall-mounted chart of the electromagnetic spectrum; his private typewriter, etc. He found all the things most conducive to thought and study. He did not feel inclined to go out of that room in order to find an environment more favorable to study. However he was not allowed to go into that room unless he was going to study. It became a privilege to be allowed to go in. He was not allowed to smoke in there. was not allowed to listen to music in there unless he had a music course. He could go outside his private study and there were places to smoke, places to have music, places to be social -- to do anything else he wanted except study, calculate and write. It became an obviously realized privilege to be allowed to go into his private study. The student found that when he was in his private study his reflexes became progressively conditioned, by association with that environment, to give himself spontaneously to study, calculation and writing. He found himself producing. His mind really began to work.

So I don't see any reason why, with the TV reaching not only the children in their private homes in the slums but children in the privacy of their homes everywhere, why we should not bring education -- school -- to where the children are. That is a surprise concept -- the school by TV always and only in the home if possible in a special room in the home.

Referring again to your cartoon of the supervisor bringing that aid into the school teacher's room: what was paradoxical and of cartoonable importance was not just presenting the same figures through another medium but the fact of the school room itself -- those little chairs. Try to remember your first experience in going to school. You suddenly find that there are the inflexibly coupled chair-desks. You fit uncomfortably into yours. The next kid has one. Everyone is pinned in to his desk. One of the children psychologically escaping his lock-up wants to go to the bathroom. You say maybe I'll go to the bathroom too. You try to escape to the bathroom. It has horrid smells. I immediately resented and as yet resent these stupid little bullpen desk-chair "strait jackets" where you are put on exhibition as they ask you to say things in front of the others so that if you venture an original thought the others can laugh. This is conducive to showmanship and rote learning but not to self-teaching and study. I think within the next 10 years we are going to have to give up school houses. Your new educational media are going to make possible bringing the most important kinds of experiences right into the home.

Let's be honest, if you want to send the children out for babysitting, send them out for babysitting. Send them out for social experience, to learn to lead parades or whatever you want them to do, but don't let's confuse our objectives. Give them a chance to discipline their own minds under the most favorable conditions. That is in their very own special private environment. We'd better mass produce "one pupil schools" that is, little well-equipped capsule rooms and send them to all the homes or we can design special private study rooms for homes. There are many ways we can do that. We'd better build that into the new life.

I'm going to say one or two other appropriate things regarding big trends. Major trends are reversing historical patterns. Decentralizing the school process is just such a reversal of historical patterns.

In regard to the educational process, Alfred North Whitehead made some very pertinent remarks when he first came to the United States from England around the turn of the century -- well before World War I. As you may remember Whitehead came to Harvard as a professor of natural philosophy. In one of his books he said, amongst other things, that there was a surprise pattern emerging in the educational process at Harvard. It was the development of the separate graduate schools at

Harvard. They consisted of complexes of new buildings in a remote place from the rest of the university. They had special staffs. At Cambridge and Oxford, you became a graduate student and specialized to a high degree simply by going to the books that were in the library, or finding the man within the university who had special knowledge. You didn't need a whole new separate school. With the Harvard Graduate Schools specialization moved forward in much higher degree of separation in America. Whitehead said that Americans liked this idea because the idea of a plurality of champion specialists seemed analagous to American professional baseball where if you had a champion pitcher and a champion catcher, or in football you had a champion punter or a champion quarterback, etc., you had an all-star team. Americans felt that by giving special advantage to those who are especially bright in special subjects, you'd be able to put together all-star culture and economic teams, by virtue of which our economy would prosper. And so the whole idea was applauded.

Whitehead noted the process by which students were selected to go to the Harvard Graduate Schools -- which were being copied by the other Ivy League colleges and a few public or state universities. Whitehead pointed out that we deliberately sorted out our students by examinations and deliberately culled out the bright ones. Next we deliberately persuaded the bright ones, if we could, to go on into the graduate schools. But Whitehead then noted that once the men became specialists within the university graduate schools that many nuances of specialization developed within the larger specialization areas. Instead of using their energies, which originally drove them in many directions of comprehensive coordination, specialists began to focus on a very fine target, which meant that being very bright and with plenty of energy, they would attain tremendous linear acceleration and get way, way out. They would be like stars, very remote in the heavens, from one another. And, Whitehead pointed out, as men of high intellectual integrity, the specialist scholars became aware, by their experience, of how little any other human beings could possibly know about what was going on in their respectively unique areas of specialization. Therefore, as men of intellectual integrity, they themselves would not think of going into another specialist's laboratory and saying "I see what you are doing. I see its significance." Thus Whitehead found that the specialists themselves were unable to communicate effectively with one another regarding their respective specializations. He found therefore that the specialists could not put together the potentials which society thought could and would be realized for the commonwealth as a consequence of the all-star teams of "way-out" scholars. The specialists proved themselves unable to integrate their findings to the comprehensive advantage of society. We now come to a real surprise. I call this Whitehead's dilemma. Since the bright ones who had become specialists did not have the ability to integrate their own accrued potentials, it was necessary to find other humans who could integrate the specialists' accrued potentials and make the product available to society in appropriate form. Having deliberately sorted out the bright ones from the dull ones this left a great residual pile of the dull ones. And inasmuch as the bright ones cannot put things together, we have to leave it to the dull ones to do so. As we look further into Whitehead's dilemma we find that there are sortable degrees of dull ones too. You also will discover that it has been the nature of modern business to specialize (until very recently when the new era of "diversification" set in). Corporations having to fill their managerial posts with the best available personnel have to do so from the first level of dull ones culled from the bright ones who were assigned to scholarship in specialization. The specializing corporations say "We cannot undertake to produce so-and-so; that is out of our field. We must not spread ourselves too thin; (for instance).

"We are auto manufacturers. Though roadways are part of the invention *automobile* we can't afford roadway making politics. If the people want our autos their politicians will provide roadways. If we provided roadways we wouldn't be able to make profits."

The wider the field of responsibility the lower the grade of "dull ones" (intellectually) available to the task. So when it comes to very wide scale undertakings such as how to make the world work, society has theoretically to leave it to the very dullest of the educational system's selective process culling. The *dulls* may be very handsome people, good golfers, good mixwer, good diplomats because of their give and take, compromise formulating senses -- undisturbed by any intellectual theories. What we are saying is that the industrial managers and the local politicians, national politicians, international diplomats are culled in descending order of scholastic brilliance by the educational processes of selection. Therefore the diplomats who have important economic biases don't really have any idea how to make the world work. As a consequence of Whitehead's (expanded) dilemma we are all faced with continuing, increasing accelerations in the development of world crises. Most hopeful sign in today's trending is the increasing use of computers -- in the solution of problems -- whose variable complexities transcend human "opinion" and provide "impartial" solutions acceptable by the dull ones -- who always suspect the advice of "long haired, egg headed, unworldly, human specialists."

The only intellectuals welcome on the business as well as on the international and national political fronts are university presidents and deans who usually trend to such because they were more prone to management than scholarship.

I have written about what I'm about to say in the Saturday Review of August 1964 in their fortieth anniversary issue on the Future of Mankind. There is a trending of the computer development which is a swiftly accelerating phase of human ecology evolution. In order to understand the logistical evolution of human artifacts and their sum total feedback transforming effects on human ecology's total environmental transition and the latter's reciprocal modification of man's evolutionary patterning in universe, you have to recognize that the computer can choose to do only what man can choose to do within the limits of variables of mathematical strategy. There are two strategically fundamental and diametric operations of the mathematics. One is differentiating out, and the other is integrating. Differentiation and integration; those are really the two great diametric limit functions. Those who are expert in the development of the computer, point out that it is very clear that the computer is already making man obsolete as a differentiator, that is as a "specialist." The computer and its very sensitive controlling subsidiary organisms which we call automation can very clearly pick out the black from the white and pick it out very much faster than the human can pick it out. It can do it all night long at 2000 degrees heat, where the human can't operate at all. So the machine as computer -- as automation -- is about to make man extinct as a specialist.

The other -- diametric -- function of the computer is integration. And the probability is that the computer and its subsidiary automation will not make man obsolete as an integrator for several million years -- possibly never. We introduce great complexities into integration, many variables and the interrelationships of which we wish to comprehend, and that is what the human mind is doing all the time. I can tell you quickly why the computer is never, or not for a long time, going to displace man as the integrator. The total variables that we deal with integratively all deal with a series of original questions which we have asked ourselves. Furthermore, those original questions and their discovered answers are relayed from generation to generation by chromosomic instructions which implement our appropriate, survival accomplishing, subconscious reflexing to a myriad variations of environment stimuli. We have at least 2 million years and possibly vast eons more of cumulative instructions for relaying our various question-askings and constant answer-relationships. Philosophers used to say that the computers would not be able to ask an original question. But it is now some time since a computer first asked an original question when it hadn't been told to ask an original question. All of a sudden as a consequence of variables in the environment and in the machine itself which had not been anticipated by the machine's designers and operators it went ahead and asked an original question. Now I must tell you one way in which that occurred. Computers can play games, and the same computer can play two games. The same computer can play chess, backgammon and checkers. Now I am going to have a computer playing backgammon and checkers at the same time. The things you have to do in order to be able to make a move in backgammon are much more complex than the things you have to do in order to be able to make a move in checkers. Therefore, the checker moves get played a little more rapidly than do the backgammon moves. So the checker moves are going like this (taps table rapidly) and the backgammon moves (taps more slowly) more slowly. The fast moves are not whole number multiples of the time lapses of the slower (bigger) moves. Every once in a while, these movement rates get to the point where one is catching up to the other and suddenly the two come momentarily in seeming synchronization. You get this synchronization hum in variable speed motors such as the twin motors of an airplane or a boat. When the computer's two game moves get into the synchronization phase and the time span for solution action by the computer is too short for the computer's solution of both (approximately simultaneously) there develops a momentary blockage interference, whereat the computer must decide to which of the two games it accords right-of-way priority. To answer -- its own originally conceived question -- the computer asks itself which -- by the computer's stored information -- of the two games backgammon or checkers is the most important to man's psychological equanimity maintenance -- and the answer comes "backgammon" -- because, though not as yet as popular as checkers, backgammon is the rich man's game and people are swiftly trending toward comprehensive opulence, ergo will need universal backgammon capability and will drop plebian checkers. Here then is an original question -- born through occurrence of an unexpected interference in experienced frequency interpatternings. Original questions of computers or humans probably are, always, products of unexpected interferences. Once asked, the theretofor original question becomes an additional brain-inventory item, to be passed on to the next generation in the chromosomic inventory. All old questions were once original questions. The human brain stored questions and answers of each unique individual's life, plus all the individual's heritage of chromosomic administered; subconsciously operative experience responses, represent, in progressive sum total, the uniquely variant integral known as individual man. The integral man will always be far more complex than any systematically organized sets of variables conceivable by man and introducable into the computer. Computers cannot in millions of years generate enough unexpected interferences to occasion enough original questions to be further integrated to approximate even an average individual let alone each of a trillion individuals' lives and their half a septillion interrelationships and the unpredictable interferences thereby to be generated.

While the computer will not replace man as an integrator in the foreseeable future the computer will undoubtedly displace man as a differentiator.

There is good historical precedence for this prognostication. It is to be found in natural history.

At the American Association for the Advancement of Science's Annual Congress in Philadelphia two years ago two papers on Extinction were read by pure coincidence in widely separated sections of the meetings of the Congress. Nonetheless, both papers were closely akin. One was a biological research paper read on the investigation of biological species that have become extinct, which sought, if possible, to identify generalizable commonalities characterizing all species' cases of extinction. The other AAAS paper was an anthropological investigation of human tribes that have become extinct which also looked for generalizable explanation. Both the biological and anthropological investigations came to the same conclusion, though remotely conducted. The generalized conclusion was that extinction is a consequence of over-specialization. In the face of inexorable, comprehensive and universal physical evolution, when species become over-specialized through successive inbreeding of special behavior characteristics and concurrent outbreeding of comprehensive adaptability there inevitably comes a time when evolution develops steps -- or wave lengths -- that are too big or too small for the specialist to negotiate. Suddenly there are increasing specie mishaps of non-adaptability -- suddenly the specie is extinct. We can say that world society through over-specialization has reached the brink of extinction. It has come to the point where its specialization has developed fission and the atomic bomb while unable to self-coordinate sufficiently to realistically guarantee that one of the lopsided specialists will not push the man-annihilating buttons. Man has, however inadvertently, as usual, developed his own destruction antiforce or "antibody" by developing the computer.

The computer suddenly makes man as specialist obsolete. Computers will force man back into "comprehensivity" functioning, which he was born spontaneously to demonstrate. We will henceforth cultivate our innate propensity for comprehensivity, and comprehensive coordination. You in music though developing special technical capability in respect to instruments, keep yourselves as individuals in constant engagement with musical compositions and orchestrations. Unlike scientists musicians tend to live logically with the whole experience of music. In developing comprehensive coordination, man develops spontaneous awareness of generalized cases which permeate all the sciences and arts. Fortified with a spontaneous awareness of general systems theory as manifest in orchestral composition and conductance musical education teachers may be able to comprehend and program computers with innately superior competence in such functioning than that possessed by professional mathematicians.

When I was introduced to you today the words genius and creativity were both used in explanation of my being "well known." I'll give you my own explanation. The only reason that I am known to you at all is because I set about deliberately in 1927 to be a comprehensivist in the era of almost exclusive trending and formal disciplining toward specialization. Inasmuch as everyone else was becoming a specialist, I didn't have any competition whatsoever. I was such an antithetical standout that whatever I did became prominently obvious, ergo well known. I'd learned that you could train for comprehensivity at the United States Naval Academy. I attended the U. S. Naval Academy at Annapolis, Maryland as a special student at the time of World War I. I found at the Naval Academy at that time an educational strategy fundamentally different from the educational strategy which Whitehead had found at Harvard which in turn all the private universities and colleges then followed, to be followed thereafter in so doing by the public colleges and state universities because the political representatives wanted to make sure that their constituents had the same educational opportunity as the more affluent youth. I found at the United States Naval Academy that the authorities were deliberately taking the bright ones and setting out to make them comprehensivists instead of specialists. To understand why this occurred we must look at the Navy in terms of General Systems Theory. The U. S. Navy as of World War I had airplanes but they were just in their infancy. Navy airplanes patrolled off the European coast looking for submarines but did not get into much fighting. Our land planes had a minor number of dogfights. But no airplanes had as yet flown over oceans. They were only local tools like landing boats. The Navy represented a vast complex of realized technology which represented objective uses of all that man had found out about his physical universe in chemistry, physics, mathematics, geography, geology, biology, et al. Navy theory asks what and where are the world's resources?

What are the world around traffic patterns in the raw conversion of resources to comprehensive man use, etc.? What are the unique performance excellences of each and every chemical element? How do you separate them and then reassociate them to bring about supreme energy controlling capability realized in floating hardware shops which carry the greatest hitting power to any point on earth in shortest time by virtue of which you can run the world? There could only be one top Navy -- the one that stayed on top of the ocean. Second best navies went to the bottom. Navies as make-believe greats had no meaning whatsoever. Naval systems theory assumes that the best defense is the supreme offensive capability. Unlike long drawn-out land warfare's sieges naval engagements are over in minutes. It took only minutes to find out who had the supreme hitting power in batteries of big guns which could be only floated by ships and weighed too much to be transported over land. The ocean covers 3/4 of the earth and was negotiable (until World War I) only by sea vessels. The Navy had to develop officers who were capable of taking all that hardware and the multi-thousands of personnel to any part of the great world ocean and maintain their sea stations anywhere around the earth. With much shop maintenance necessary to such a task it was essential that the officers have the scientific, logistical and psychological capability to build great bases anywhere around the shores of the one-ocean world whose three big "bays" are the Atlantic, Indian, and Pacific. And the one-ocean water world was until 1919 "the world."

For a few decades the fighting-bombing airships took over world control through domination of the air-ocean world. Since then supreme control of earth is in dynamic balance and its dominances can be won only by superior capability of satellite and planetary maneuvering in major universe. But general system theory as first conceived in establishment of world navies as yet governs supreme control systems. In sending your men off around the world in the days of naval supremacy and in making this great investment in the Navy you had to be reasonably certain that it would be supreme around the world. The furthermost world point is always half way around the world, away from you or official "home." In order to be able then to have such an extraordinary operation as a world-controlling navy you had to have officers who not only understood a great deal but were operatively capable of dealing with all circumstances. They had to be comprehensive industrialists so they could build a naval base anywhere around the world and rebuild and improve their own ships. They had to understand the history and principles of world economics. They had to understand the ambitions of all the world's nations. They had to understand philosophy and the history of development of law and human rights. The officer training was comprehensively specific and always broadening. The comprehensive coordinating capability of the naval officers must continually multiply. The Naval Academy training was only the beginning. The whole service experience was continuous post-graduate work in comprehensivity with always enough penetration in depth in all main classes of science, technology and humanities to make possible the naval officer's effective communication with specialists in any field. Naval officers were subject to selective promotion, in contradistinction to automatic promotion, by the numbers, in the Army. Why this selective promotion? To answer that requires some historical reconnoitering.

Abraham Lincoln was the first president of the United States who was wired to the army at the battlefront with a telegraph line. With Lincoln, for the first time in the history of man, the fatal decisions of a nation did not have to be made at the front but could be obtained in split seconds by wire from the central authority of the society. Up to that time, the leaders of states had to be near or on their battlefronts in historically crucial battles. But, Abraham Lincoln didn't have any wires to the Navy. Yet the Navy was the first line of national defense against exterior forces of destruction. Because the sea covered the 3/4 of the earth the Navy had to cover 3/4 of the earth. Navy was inherently world-minded. "Join the Navy and See the World" was its enlistment slogan. You couldn't have wires to ships at sea. Early in this 20th century, came wireless communication by radio with ships half way around the world, at sea. But until and including World War I, we didn't dare trust the top-secret information to the then only 13-year old, and openly tuneable radio. We didn't dare put important secret messages on the air. Strategically vital messages had to be carried by courier, and the courier couldn't get from here to there any faster than you could get a ship from here to there. However, since we didn't dare trust radio with secrets of supreme national strategy, up to and through World War I, the naval officers who took the nation's world-commanding "hardware" off to sea had to be trusted not only with the ultimate fate of the nation but also with the pro tem responsibility of running the world until couriers could be exchanged with the nation's elected leader. To meet this ultimately potential responsibility required the most comprehensive capability obtainable by scientific training and selective promotion. The ships' captains and flotilla, division and fleet admirals had to have complete local autonomy and authority. The captain of the ship had control over the life and death of the people on board. I was brought up in that navy and learned its comprehensivity breeding educational strategies. After World War I, we found that we could "scramble" the radio so that it was proof against deciphering. We learned much more about electronics. Suddenly democracy withdrew the autonomy of the captains and commanders of ships and admirals of the fleet. The authority had centralized, in physical fact, into the White House and right up to the president's telephone. There is a widely held misconception that holds centralization of authority to be an arbitrary political volition. No so. It was a physical communication fact brought about through electronic inventions. Now it is inexorable, and it's exercised officially by laws or unofficially by lobbies. From 1919 on, the Navy too began its conversion into the specialization that controlled all other educational discipline; Navy began to have its naval aviators, submarine men and so forth. I happened to attend the United States Naval Academy at Annapolis and to live through the last, pre-1919 days of comprehensivity of naval officers training as a discipline carefully developed over centuries and relayed secretly by the British Admiralty to the U. S. Naval authorities during World War I, as the British Navy found itself inadequate to cope alone with the Germans' submarine warfare. In 1927, I set about deliberately to recall everything I could about the psychological, philosophical, mathematical and physical strategies for developing the comprehensivity disciplines. A great deal of the comprehensive adaptability was attained through mathematics which represents the most generalized of all the disciplinable capabilities. I found it possible to reestablish comprehensive self disciplining in 1927. But to keep in effect I had to keep abreast of scientific and technical evolution. When I was the technical consultant, which was in fact the technical editor, of Fortune magazine for several years this as with other jobs became an educational affair. As a consequence I found, as I had for many years in other roles that I could go into any factory or laboratory in any industry and comprehend both the old and the newest equipment and its integrated functioning. I find it possible to keep up with the generalized principles of science, technology, logistics, economics, et al, to such an extent that I am able as yet to communicate at a critically effective level with scientists in many directions.

This first picture (FIGURE 1, p. 141) is what I call the Profile of the Industrial Revolution. I found that the profile is best exposed by the chronological rate of acquisition by man of the scientific controls over the basic inventory of Cosmic Absolutes -- the 92 elements.

It is a curve of acceleration reliably portraying the fundamental rate of impingement of science and technology upon man, as referenced to regular calendar clock time. Lists of historical inventions and discoveries are formless because they are inherently open-ended, i.e., infinite. There is one closed or finite family of pure scientific events. It is the history of the isolation by man of the 92 regenerative chemical elements. Membership in this family of prime universe patternings requires a "credit card" identification of specific and uniquely consecutive matching electron-proton numbers. The family must consist of all 92 unique sets from 1 to 92 electron-proton counts inclusive, and none other. That is the curve herewith presented. To it has been added the curve of the rate of isolation of the, thus far, subsequently isolated, non-self-regenerative chemical elements beyond 92. These elements of negative universe are shown for rate-of acquisition comparison only.

The chart covers 800 years. It runs from A.D. 1200 to A.D. 2000. Nine chemical elements (see list at lower left corner of chart) were already known to and isolated by man when recorded history dawns. The

SECTION - I

EARTH ORBIT IN MAN MADE ENVIRONMENT CONTROL: PRODUCT OF SUCCESSFUL APPLICATION OF HIGH PERFORMANCE PER UNIT OF INVESTED RESOURCES

PROFILE OF THE INDUSTRIAL REVOLUTION AS EXPOSED BY THE CHRONOLOGICAL RATE OF ACQUISITION OF THE BASIC INVENTORY OF COSMIC ABSOLUTES–THE 92 ELEMENTS

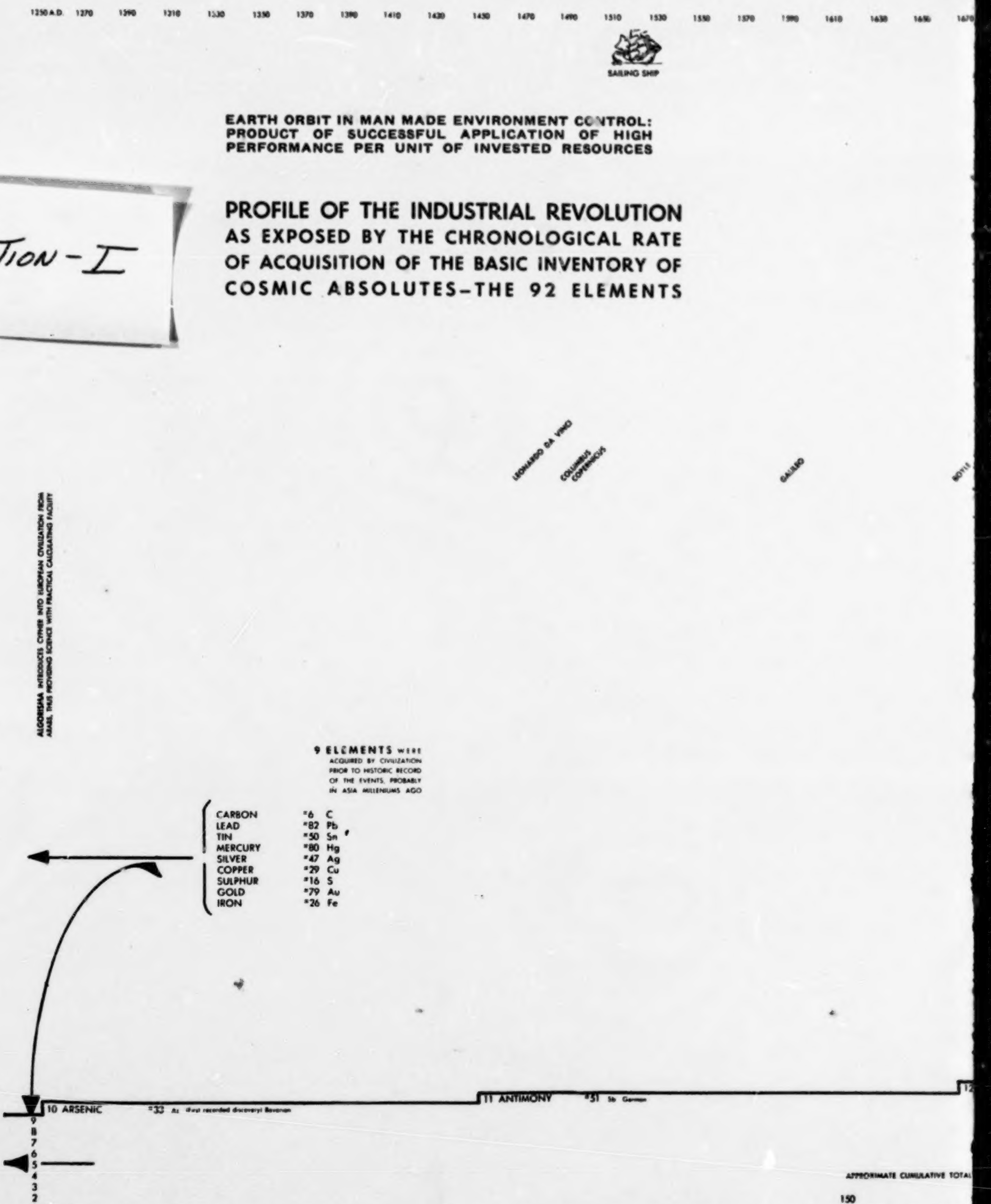
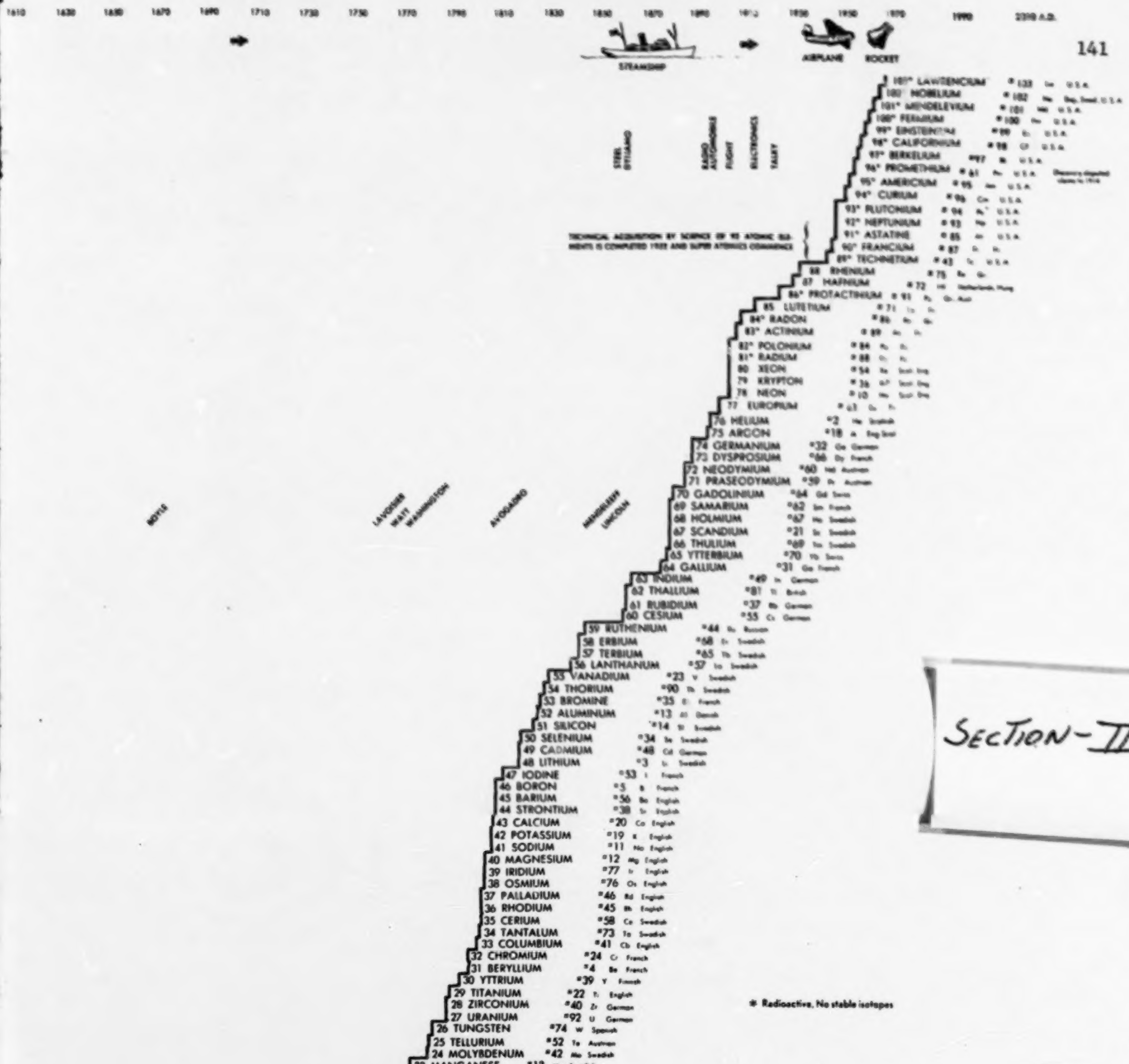


Figure 1



SECTION-II

ure 1

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first known isolation of a chemical element was that of arsenic in A.D. 1200 in Italy. There is a 200-year lag to the next isolation -- antimony -- then another 200-year interval to phosphorus, then only a half-century gap to cobalt, whereafter, the list takes "off" averaging a climbing rate of one isolation every two years.

The swiftly rising curve is not smooth. There are three distinct slow-down "shoulders." These are occasioned by periods of universal warring. Pure science activity, which these isolations represent most truly is frustrated altogether by the atmosphere of war. Because the earlier discoveries of science are often converted to technological advantage in wartime, science has been thought, erroneously, to prosper in wartime. What prospers is applied science and production technology but not pure science, not basic thinking.

It is seen on this chart that 1932, popularly identified as the "depth of the depression", is, in fact, a moment of epochal success. In 1932 the last of the finite family of 92 regenerative chemical elements occurring spontaneously in nature, was isolated. For the first time in known history man had in neat "know-how cans" on the "shelf" all the basic ingredients for reassembling the physical universe's basic pattern behaviors in preferred arrangements such as metalic alloys. This permits greatly increased performances per units of controlled and invested energies. It makes "possible" theretofore undreamed-of physical advantage gains to be realized for all of humanity. It is the beginning of man's consciously successful participation in the evolutionary events of nature. This conscious and scientific participation, in turn, leads swiftly to realization of physical, metabolic success of man in universe.

After 1932 and the 92nd isolation, there is an important, but temporary, slow-down in further isolations. Scientific man became momentarily preoccupied in taking apart the nuclei of those fundamental chemical elements. Fission and the theoretical release of the elemental energy 5 years later, and realistic release 12 years later, was inevitable to that 92nd and final isolation of the full family of prime elements in 1932.

It is interesting to note that the post-uranium-element isolations, starting with 93, occur with extraordinary regularity. Witness the approximately straight line ascent of the post-92 isolations as well as the direct correspondence of the elemental numbers with the numbers representing the successive order of isolations. This correspondence is unlike the discovery pattern theretofore occurring. For instance, isolation number 97 is berkelium -- element number 97 -- with 97 electrons and 97 protons.

In the first 92 isolations, however, the order of isolation does not correspond to the atomic number order. The 28th isolation was zirconium -- element number 40; the 31st isolation, beryllium was element number 14; the 18th isolation was hydrogen, which was element number 1, meaning 1 electron and 1 proton and so forth. None of the atomic numbers correspond to the number in order of successive isolation within the "first family" of 92 elements.

The extraordinary pattern disclosed by this curve of man's acquisition of fundamental controls over the basic energy patternings of nature portrays only the evolutionary rate of development of pure science. It is subjective in that it establishes only a potential use -- advantage for man. Without discovered use or technical capability to use having been as yet invented by man, this pure knowledge remains only potential.

In view of this curve of development of the high fundamental potential, it is appropriate to ask ourselves: What is the most comprehensive change in the relationship of man to his earth and his universe that may be realized physically by the application of this "pure (physical) knowledge"?

Probably the most significant consequence of the application of this knowledge is man's alteration thereby of his ecological patterning in universe.

Amongst all the species of life on earth, none of them, other than man, has consciously participated in the fundamental alteration of their overall, lifetime ecological sweep-out patterning. Eels, plovers, and many other biological species unconsciously were forced to alter their total lifetimes' cumulative ecological patterning -- by the comprehensive earth surface changes induced by the successive ice ages. As ice receded, cold-area-breeding types of life were forced to ever-larger annual migrations between the most favorable tropical feeding grounds and arctic breeding grounds, respectively. This was unconscious participation in the fundamental alteration of ecological patterns. The designing and building of an hydroelectric dam or development and production of an antibiotic constitutes conscious participation by man in the evolutionary pattern transforming of universe.

Up to and including, my own father's generation, men were limited essentially to motion accomplished almost exclusively by their own leg motion -- mildly increased by horse and vehicular travel. In 1914, American man was averaging 1640 miles per year total travel. Thirteen hundred miles were accomplished by his (integral) legs, and 340 additional miles were accomplished by his (non-integral) "vehicles." This vehicular augmentation was a motion increase of only 25% over his legs-realized motion. As a consequence of mass production of the equipment of mobilization during World War I, in 1919 U.S.A. man covered 1600 miles by vehicle alone -- in addition to his continued 1300 miles per year walking -- a total of 2900 miles per man. By 1942 U.S.A. man was averaging 4500 miles per year by vehicles plus 1300 miles per year by legs or an annual total ecological sweep-out of 5500 miles per year.

In view of the "life expectancy tables" we find that the total miles of an average human's lifetime's mileage, to-and-froing, ecological "sweep-out", up to and including my father's lifetime, was only 30,000 miles. However, at 69 years of age, I have already covered three million miles which is one-hundred-fold the lifetime distance accomplished by humans of any previous generations. I am one of a class of several million human beings, who, in their lifetimes, have each covered three million miles or more. The class of senior airline pilots has covered severalfold my three-million-mile "sweep-out". Astronauts equal my three-million-mile "sweep-out" every one hundred circuits of the earth, i.e., in approximately every four days of Earth orbiting. All these dramatic alterations of the ecological pattern of man, as shown on the chart have accrued directly to the inventory of Cosmic Absolutes --"canned" and put on the "potential shelf" by the pure scientists, working like bees to store the "honey" utterly unaware of the value to man of that honey or of what man will do with it.

To realize ecological pattern transformation requires that man penetrate environments theretofore intolerably hostile to his naked existence. His invention of hats and clothing first permitted man to penetrate hot and cold regions theretofore intolerable to him. Clothing represented man's first environment-controlling and ecology-transforming tool. When man built himself a house making possible his existence during external development of hostile conditions, it did not alter, however, his ecological patterning geographically -- anymore than did his retreat into a cave. To make fundamental alteration of his ecological sweep-out, man must propel his harm-immunizing, controlled environment into geographical realms of previously intolerable environmental conditions. He must propel the environment-controlling device by his control of power systems external to and greater than his bodily power system.

In order to maintain a uniform measure of the magnitude of effectiveness of such (previously intolerable) hostile environment penetrations by man, I have documented man's circumnavigations of the earth -- inside his succession of improved environment-controlling machines, as propelled by energy patterns, which, though indirectly controlled by man, are nonetheless external to and greater than his integral, metabolic energy-conversion, propulsion capabilities.

As shown by little symbolic pictures along the top area of the chart, the first such circumnavigation of Earth by man was accomplished within the wooden sailing ship, which took approximately three years. About 350 years later man circumnavigated Earth in a steel steamship, taking approximately three weeks. Seventy-five years later he circumnavigated the earth in an aluminum airplane, taking approximately three days total flying time. Thirty-five years later he circumnavigated Earth in an exotic-metal structured, rocket capsule, taking a little over an hour for each orbit cycle.

We have in the decreasing intervals between the progressive modes of circumnavigation as well as in the contractions of the successive elapsed times for the circumnavigations both a second and third power acceleration of the original velocity rate of pure science growth as demonstrated by the prime family of 92 chemical element isolations. To be realistic we must now multiply this third power acceleration by a fourth coefficient. The fourth coefficient is the conceptual regeneration induced in the human mind by the concomitant visual information circumnavigation of Earth now being accomplished by the team of Telstar satellites whose world-around relayings of the electromagnetic wave-borne TV communications will result in a four-dimensional acceleration of man's teleologic and conscious participation in universal evolution.

The extraordinary fourth power acceleration thus to be realized by man in the distribution of technology-generating information, through computers -- electronics in general -- and the world-around information relay, will integrate the total acceleration of the rate of human ecology transformation to a fifth power progression. Within ten years anything reasonably "thinkupable" by science fiction will probably have been realized.

I know of no device as effective as this chart to generate comprehension of the unprecedented rate of experience acceleration into which man has now entered.

Along the bottom of the chart the numbers 150, 450, 1450, and 10,000 occur in approximation of the cumulative number of key science and technology inventions realized by all men, everywhere, up to the historical dates at which those numbers are posted. I have not yet made accurate check of the 1964 historically cumulative number of inventions, but it is in the magnitude of millions. It can only be measured effectively at a later date.

Just go ten years to the right of the first man orbiting of Earth in 1961, and you may safely say that by 1971 anything dreamable can happen. When I stand up here for instance and talk about changing obsolete, ineffective and debilitating school patterns, the established reflexive conditioning of our brains tends to expect that it would take another 100 years to bring about that change. But the rate at which information is being disseminated, integrated and inhibited into our current decision making regarding the subjects I am discussing comprehensively discloses that my discourse constitutes subconsciously the general atmosphere of our thinking. The changes indicated as desirable are going to happen very, very rapidly. And I would say to you as educators, thinking about what you may dare to undertake, "don't hesitate to undertake the most logical solutions. Take the biggest steps right away and you will be just on time!"

(FIGURE 2,p. 149) Change has become recognized now as normal. Just think. Isaac Newton's first law of motion was "A body persists in a state of rest." Then he said, "or in a line of motion" as a secondary thought, "except as affected by other bodies." Normal was at rest. Change was abnormal. Einstein gave us the opposite concept in which he made the velocity of light the normal speed and the normal pattern of an all-acceleration universe. Any other lesser velocities or apparent motions were abnormal. We are now in an all-Einstein world. As a consequence of the extraordinary acceleration of technology in World War II, brought about by the technological competition to have airplanes out-perform each other, we suddenly came to the realization that change was realistically normal. Man is now actually coordinate with evolution as a continual process of change. Most recently business men have been acknowledging change to be normal and most profitable. In the past men felt that (other than fashion) changes would always be too costly and preclude profit making. Yesterday's businessmen opposed change politically. The 1964 Presidential election saw business supporting change for the first time.

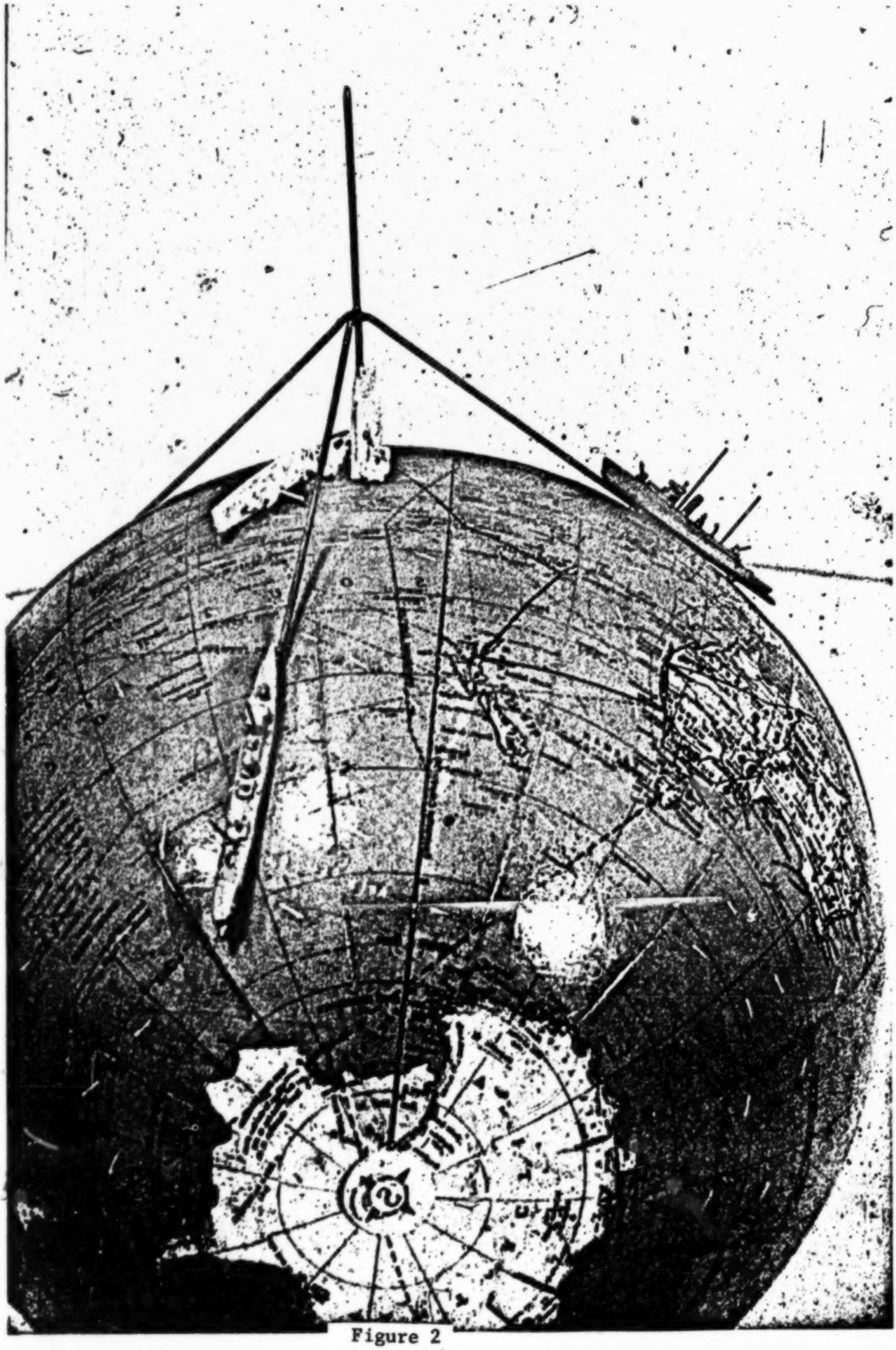


Figure 2

The picture you are looking at now is of a model of a collision at sea . . . . I was told in school about Gallileo's parallelogram of forces. It is done on a plane where you had one body running at a certain velocity in a given direction. You multiplied its weight times its velocity and that made the length of the line; we called such a force line -- a vector. Then we had another body which was on collision course with the first moving body, which we had vectored. And you took the second moving body's weight times its velocity and that was the length of the second line or vector. And the second body also was going in a unique and discretely identified compass direction. You had these two moving bodies come together and then you made two other lines parallel to the first set of two vectorial lines and they made a parallelogram with the first two vectors. Next you made a long diagonal in that parallelogram from the point of collision to its diagonally opposite corner. Then you extended the long diagonal outwardly from the parallelogram from the point of collision, extending this line to a length equal to the diagonal already constructed inside the parallelogram and that external equidistant extension of the diagonal of the parallelogram was called the resultant of forces. In the Navy I had also been taught Gallileo's parallelogram of forces at the Naval Academy. For some reason that I don't know of it was never considered at the U. S. Naval Academy that when two ships ran into each other, Gallileo's force diagram told us that following the collision as indicated by the "resultant of forces" the two ships were supposed to waltz north-northeast for 12 miles together. I saw as indeed most all sane men see that such behavior was just what the ships didn't display after collision. One of them went in towards the center of the earth and that wasn't in the diagram.

I decided that this criticism was typical of my general suspicion that we were not starting with the right set of axioms or simplest concepts, as for instance when we said that "plane" geometry is more fundamental and therefor easier than solid geometry, and that a dynamical geometry was something prohibitively "way out" in relative difficulty of comprehensibility. "Geometry didn't have qualities of energy!" said the pure mathematicians. All that optimum abstraction of pattern from reality of experiences was thought to be simple. I discovered that nothing can be more complicated than "plane" geometry nor a more highly specialized case of pure mathematics. Plane geometry is the most special case of "not true at all."

So here is a picture of two ships running into each other on the wavy surface of spherical Earth. One of the ships goes towards Earth's center. One of them does go a few hundred feet in the direction of Gallileo's resultant of forces but not 12 miles. We find that in reality four forces are operating. The two coming conically together around the Earth plus gravity, plus the resultant. When the ships first ran into each other, they actually rose outwardly from Earth's center because in acceleration both ships were "trying" to leave the earth. If they could accelerate faster like rockets, they could leave the earth. So, when two ships collide they usually rise outwardly against gravity as this picture shows before they subside, and then one or both either go into the bottom of the sea or go a few yards in the direction of the resultant of forces. The pattern of real force lines looks very much like a music stand -- three vectorial legs spread out with a fourth vertical vector. And so I began to discover and study what we may call fundamental angular degrees of the vectorial interactions of universal freedoms.

(FIGURE 3, p. 153) I'm going to give you a swift but fundamental insight in respect to the fundamental vectors and their degrees of universal freedom. I think that these vectorial and angular degrees of freedom relate mathematically to the fundamentals of music. These are the fundamental generalizations of structure and transformation.

I said to myself back in 1917, "Inasmuch as the planar force diagrams with which we were taught are, to say the least, 'inadequate' is it not possible for us to find an adequate model for ourselves -- an omnidirectionally interacting, minimum set of vectors?" We have to deal always in the reality of an omnidirectional physical universe. I said, "How many forces are really operating on us?" For instance, there are clusters of stars out there, millions of stars, that look superficially like just one star, such for instance as the Pleiades. I am sure that the gravitational effect of that group on me is a linear one. "So how many fundamentally separate force lines of universe are there impinging on me? Into how many separate vectors do all the stars' and planets' gravitational pulls on me collect? How many universe lines (like the lines tying a ship to a dock) are pulling constantly on Earth and even on me?" So I contrived an experimental device for exploration of the problem. At the top right-hand side of the picture you see something looking like a ping pong ball on a thread. The ping pong ball represents me and the universe is the thread whose other end is "fixed." I've found a hole in the stars and I go "zooping" out as far as I can so that all of the stars of universe seem to collect and appear as approximately one. One thing that I can't do is get out of, or absolutely away from, the universe so the single string representing the gravitational pull of all the remotely bunched stars of universe is always attached to me.

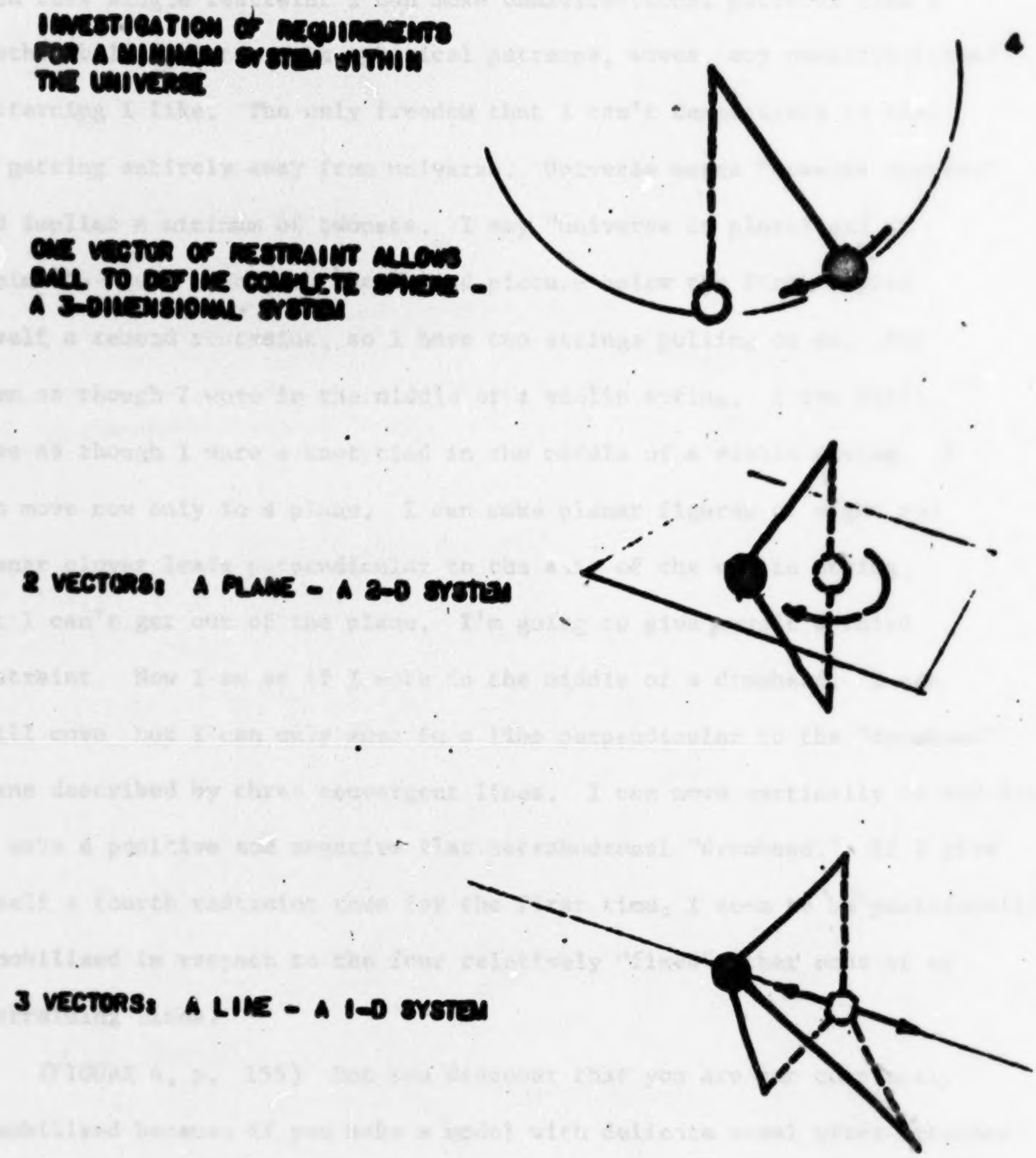
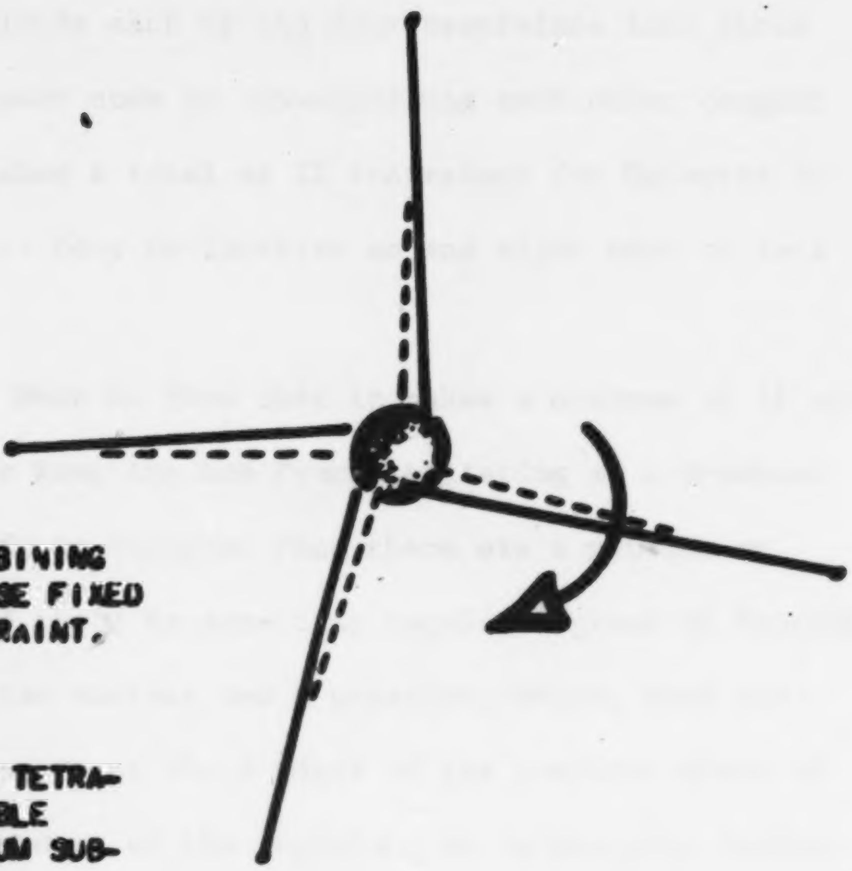

INVESTIGATION OF REQUIREMENTS FOR A MINIMUM SYSTEM WITHIN THE UNIVERSE
4
ONE VECTOR OF RESTRAINT ALLOWS BALL TO DEFINE COMPLETE SPHERE - A 3-DIMENSIONAL SYSTEM
2 VECTORS: A PLANE - A 2-D SYSTEM
3 VECTORS: A LINE - A 1-D SYSTEM
4 VECTORS: A POINT - NO DISPLACEMENT

Figure 3

With this single restraint I can make omnidirectional patterns like a "tether ball." I can make spherical patterns, waves, any omnidirectional patterning I like. The only freedom that I can't demonstrate is that of getting entirely away from universe. Universe means "towards oneness" and implies a minimum of twoness. I say "universe is plural and at minimum -- two." Now, in the second picture below the first I give myself a second restraint, so I have two strings pulling on me. Now I am as though I were in the middle of a violin string. I can still move as though I were a knot tied in the middle of a violin string. I can move now only in a plane. I can make planar figures of eight and planar clover leafs perpendicular to the axis of the violin string, but I can't get out of the plane. I'm going to give myself a third restraint. Now I am as if I were in the middle of a drumhead. I can still move but I can only move in a line perpendicular to the "drumhead" plane described by three convergent lines. I can move vertically to-and-fro to make a positive and negative flat tetrahedronal "drumhead." If I give myself a fourth restraint then for the first time, I seem to be positionally immobilized in respect to the four relatively "fixed" other ends of my restraining lines.

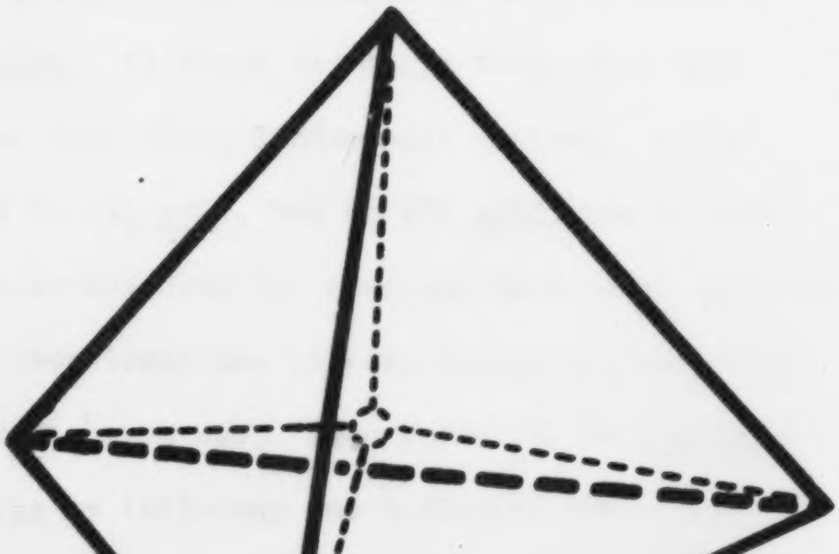
(FIGURE 4, p. 155) But you discover that you are not completely immobilized because if you make a model with delicate steel wires attached perpendicularly and symmetrically to a steel ball at the center of the modeled system of restraints you'll find that you can put a stilson wrench on that steel ball in the center and you can always torque or rotate it, so I (as the four-foldedly restrained ball) can't move from that localized spot. But I can twist in place, and I can twist locally in several different ways. In fact, in order to keep "me" -- in the ball -- completely



NOTE THE POSSIBILITY OF TURBINING WITHIN THE POSITION OTHERWISE FIXED BY THE FOUR VECTORS OF RESTRAINT.

THE FOUR VECTORS DEFINE THE TETRAHEDRON: THE FIRST IDENTIFIABLE "SYSTEM" (A PRIMARY OR MINIMUM SUBDIVISION OF UNIVERSE).

THE BALL LIES AT THE CENTER OF GRAVITY WITHIN THE TETRAHEDRON.



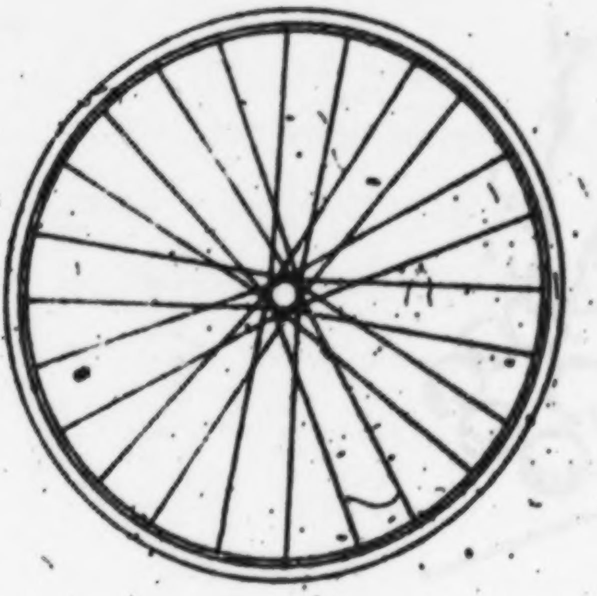
THE TETRAHEDRON ....

Figure 4

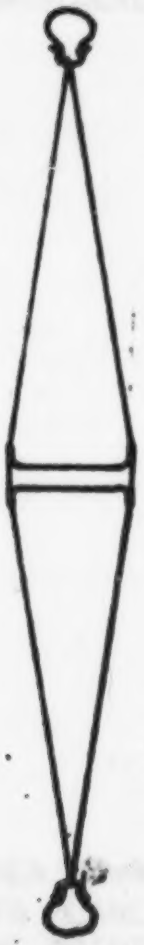
immobilized you have to divide each of the four restraints into three lines each and then they must come in crisscrossing each other tangent to the sphere. Thus it takes a total of 12 restraints for Universe to completely immobilize me -- four to localize me and eight more to lock me rigidly into a system.

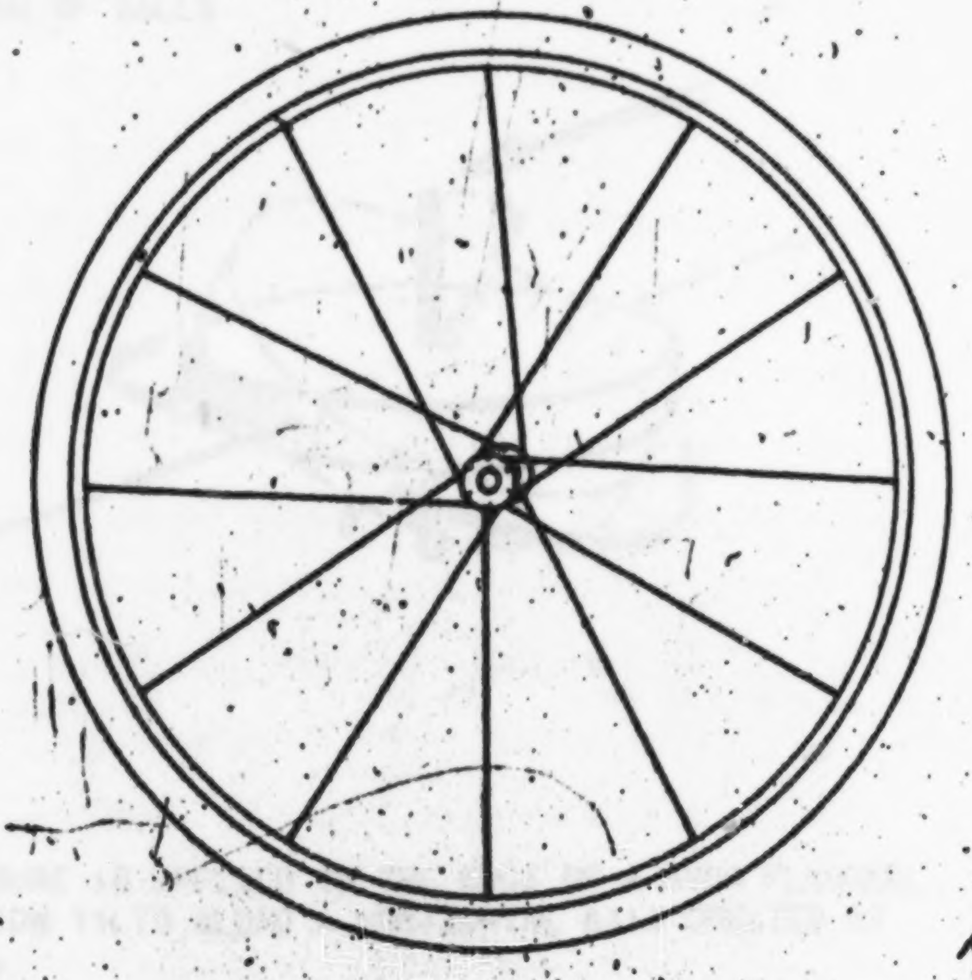
(FIGURE 5, p. 157) Next we find that it takes a minimum of 12 spokes to make a wire wheel -- to keep the hub from oscillating as a drumhead or twisting in any way. So we discover that there are a minimum of 12 fundamental vectors and their intersecting angular degrees of freedom in the universe: 6 positive vectors and 6 negative, which, when symmetrically interacting, represent the 6 edges of the positive phase of the tetrahedron and the 6 edges of the negative, or vertexially inside-outed phase of the same vectorial tetrahedron.

(FIGURE 6, p. 158) I'm not going to tell you much about this picture except that it explains precession. It shows why a gyroscope does what it does. Children learn a great deal about fundamental motions. Using their own bodies they learn how to (1) roll, how to (2) spin, how to make a big circle (3) orbit, while also spinning (so they can have axial rotation -- spin -- while in orbit) and they learn how to turn themselves partially (4) inside out by sticking their tongues out. They learn (5) to oscillate, i.e., how to converge and diverge by inflating and deflating their lungs. But when you say (6) "precession," that is one motion that they do not understand, because they did all those other five motions with their own integral bodies forgetting the reaction motion of the earth when they rolled and orbited, etc., for the reaction motion of Earth is not visible to them. Precession is the motion effect of a body in motion upon any other body in motion. So when the children just take a step



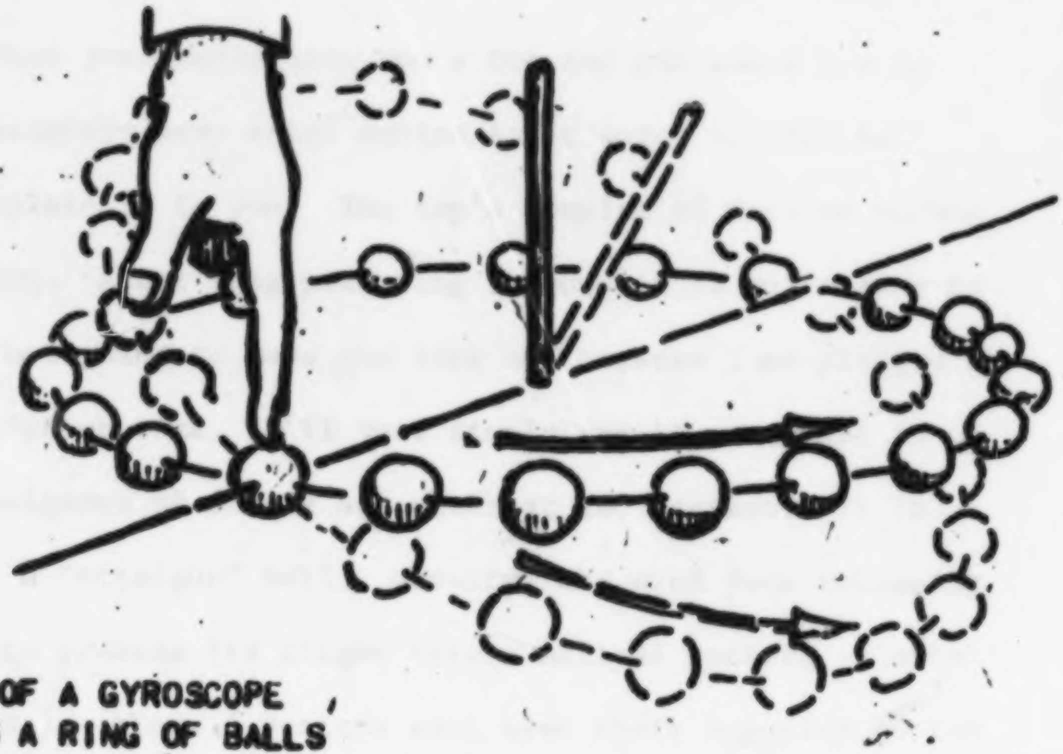
Many spokes keep rim from bending outwardly any further while load is suspended by central vertical spokes successively leading from top of wheel to hub and its load.



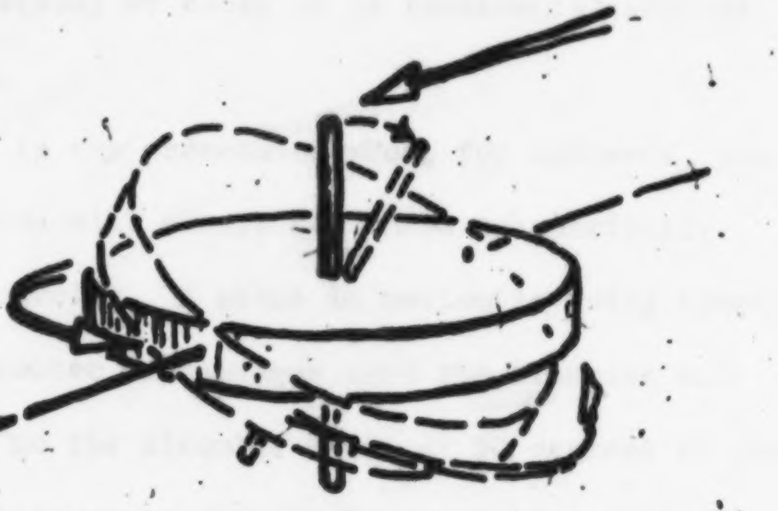


Takes minimum of 12 spokes to fix hub position in relation to rim. Six positive diaphragm, six negative of which respectively three each are positive and negative opposed turbining or torque members.

Figure 5



THE FLYWHEEL OF A GYROSCOPE CONSIDERED AS A RING OF BALLS



WHEN DOWNWARD PRESSURE IS APPLIED TO THE EDGE OF A GYRO FLYWHEEL ITS PLANE OF ROTATION TILTS ALONG A HORIZONTAL AXIS CREATED AT THE POINT OF FORCE.

THIS EFFECT FROM DOWNWARD PRESSURE AT THE EDGE CAN BE PRODUCED BY A HORIZONTAL FORCE AT THE AXIS.

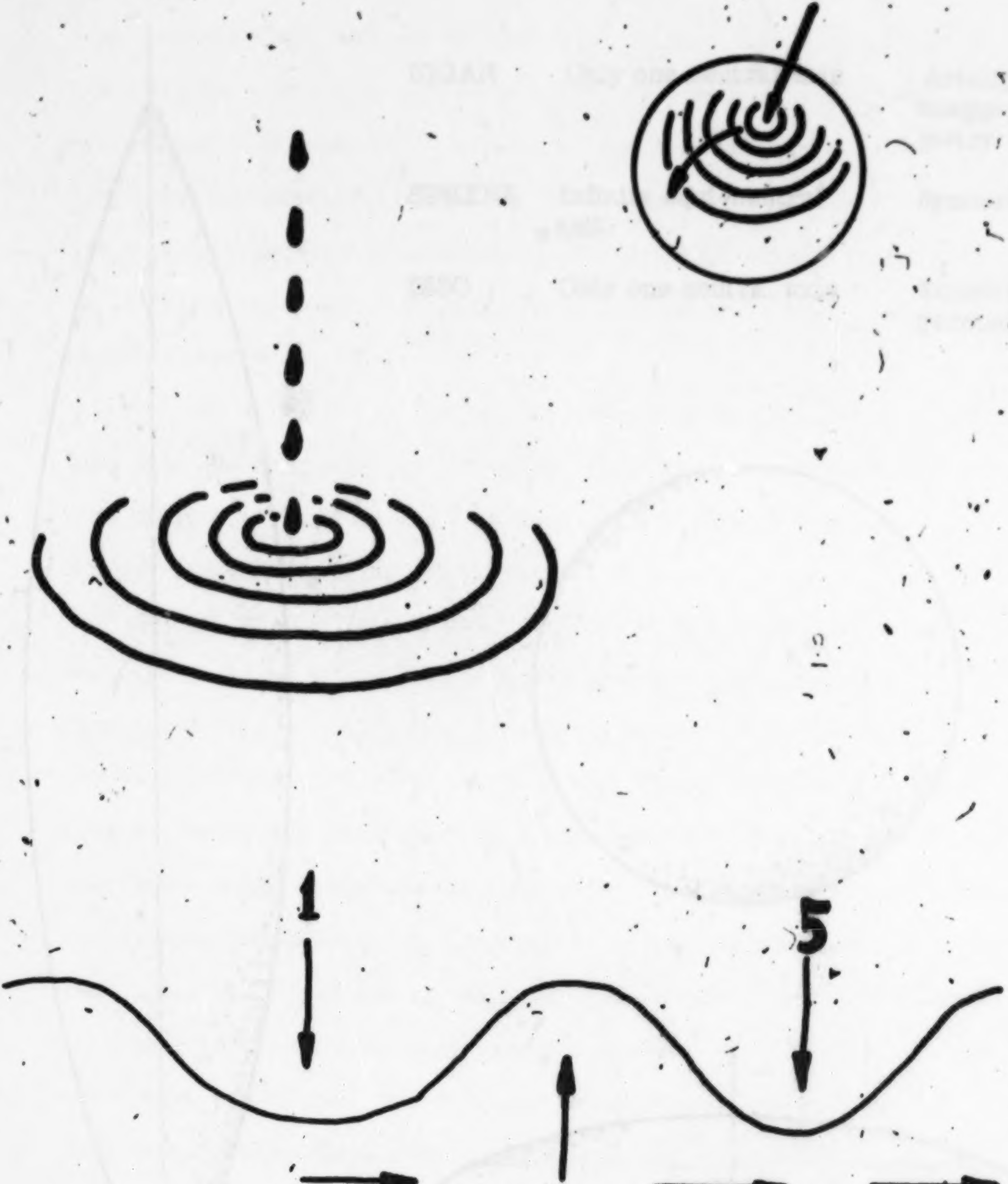
THEREFORE THE AXIS OF THE GYROSCOPE TIPS AT RIGHT ANGLES TO THE FORCE EXERTED. SUCH A NINETY DEGREE REACTION IS A PRECESSIONAL EFFECT.

Figure 6

they are literally precessing the earth and the earth is constantly precessing them. When your uncle gave you a top and you asked him to explain its slow secondary wavy axial motion as it spins rapidly he couldn't seem to explain it to you. The top's complex of motions within motions is precession. After long pondering I found it is quite easy to explain. But I am not going to have the time now because I am pledged to finish this exposition on time. I'll just simply say to you, that in precession, the resultants of forces are never at 180 degrees. It is impossible to throw a "straight" ball. Gravity, the wind your releasing hand and throwing arm precess its flight into a helical pattern -- often imperceptible (almost). These 6 motions each have their opposite motion -- ergo our (6 positive, 6 negative) or total of 12 fundamental angular degrees and vectors of freedom.

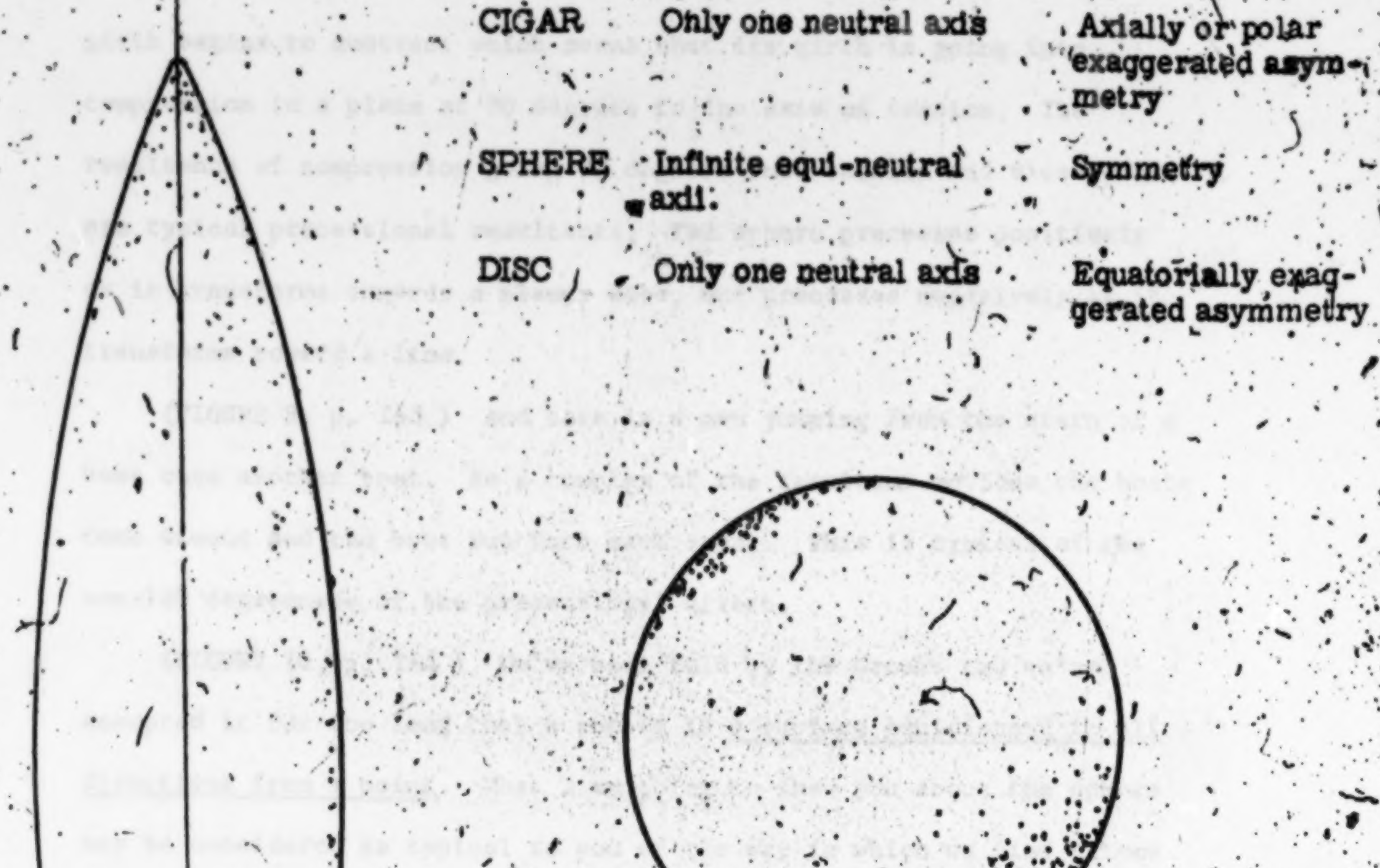
(FIGURE 7, p. 160) Here is the precession when, for instance, you drop a stone into the water. You will always get those eccentrically developing waves in beautiful circles. A stone in motion is going towards spinning and orbiting Earth's center and plunges into the Brownian and other movements of water. Out go the circular waves at 90 degrees to the stone's line of motion. And those waves that go horizontally outwardly precessionally beget vertical motions. Then the vertical motion of the waves begets precessionally a further horizontally outward motion. The precessional 90 degree regenerations of motion altogether cause the wave's pattern -- as a whole series of precessions.

(FIGURE 8, p. 161) When we push on a cigar-shaped column it tries to become a squash. Its girth gets bigger. Therefore, its girth is stretching thinner. Therefore, its girth is in tension in a plane at 90 degrees to the pushed together axis. While you are pushing on the



A PRECESSIONAL SEQUENCE: ILLUSTRATED BY WATER WAVES RADIATING FROM A CENTRAL POINT, EACH FORCE PRODUCING A REACTION AT 90°.

Figure 7



CIGAR	Only one neutral axis	Axially or polar exaggerated asymmetry
SPHERE	Infinite equi-neutral axii.	Symmetry
DISC	Only one neutral axis	Equatorially exaggerated asymmetry

Figure 8

ends the cigar column's girth is going into tension at 90 degrees. I pull on the rope, and put it into axial tension. As I do so its girth begins to contract which means that its girth is going into compression in a plane at 90 degrees to the axis of tension. The resultants of compression going 90 degrees into tension and vice-versa are typical precessional resultants. The sphere precesses positively as it transforms towards a planar disc, and precesses negatively as it transforms toward a line.

(FIGURE 9, p. 163) And here is a man jumping from the stern of a boat onto another boat. As a complex of the resultant motions the boats come around and the bows run into each other. This is typical of the non-180 degreeness of the precessional effect.

(FIGURE 10, p. 164) We've been told by the Greeks and we've accepted it for too long that a sphere is a surface equidistant in all directions from a point. What I am going to show you about the sphere may be considered as typical to you of the way in which we find axioms both erroneous and experimentally inadequate. A sphere, as defined by the Greeks, being a surface equidistant in all directions from a point, cannot have any holes in it. Because if it had any holes in it, it would turn inwardly as you came to the holes and therefore the surface would no longer be the same distance from the center. So the definition of the Greeks was of some kind of a continuously and absolutely "solid," ergo utterly impervious surface phenomenon that completely surrounded that point. The definition means that the Greek sphere would then divide the whole universe into all of the universe outside the sphere and all the rest of the universe inside the sphere and because there are no holes in it, there could be no traffic of any kind between the

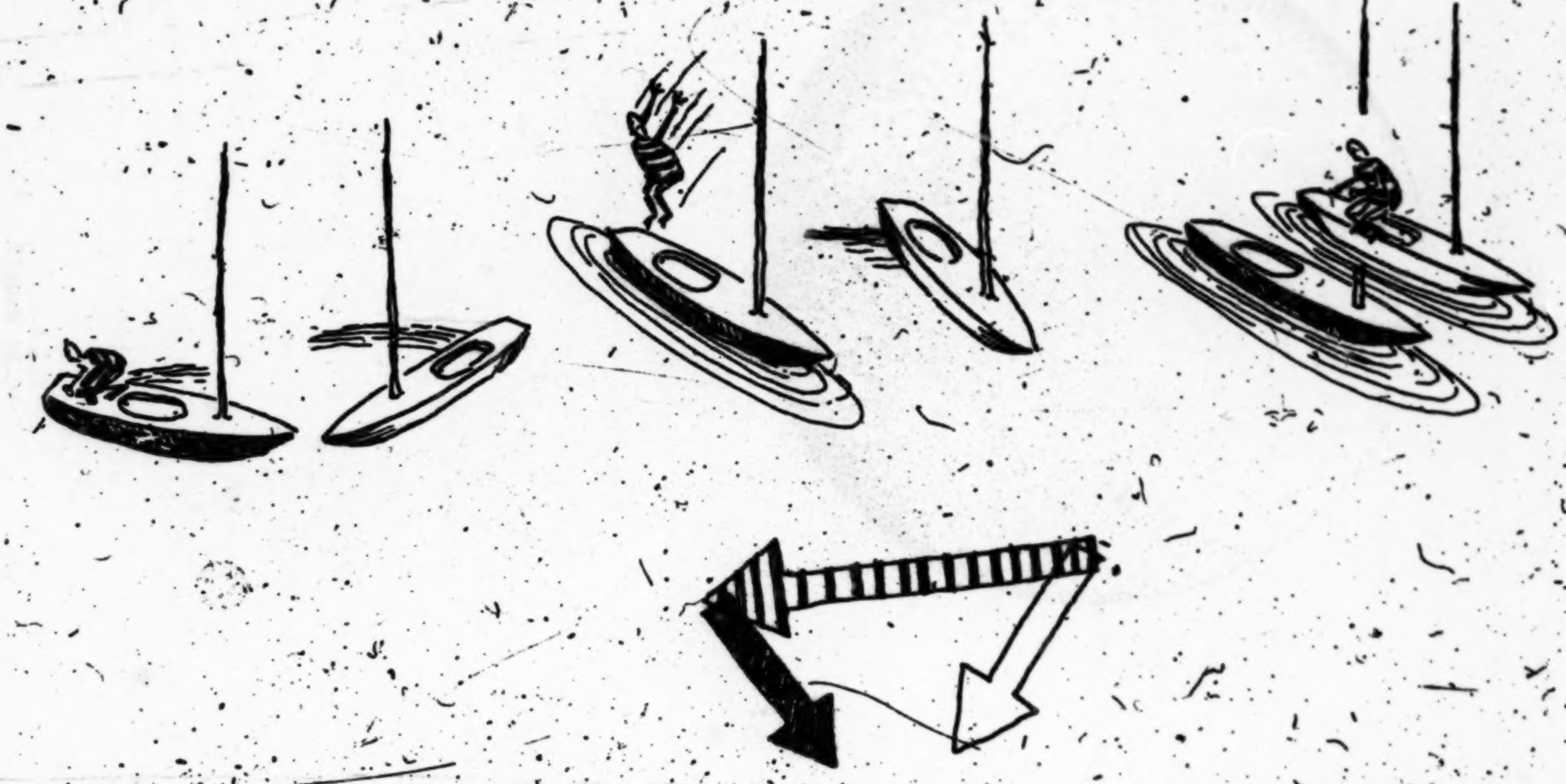


Figure 9

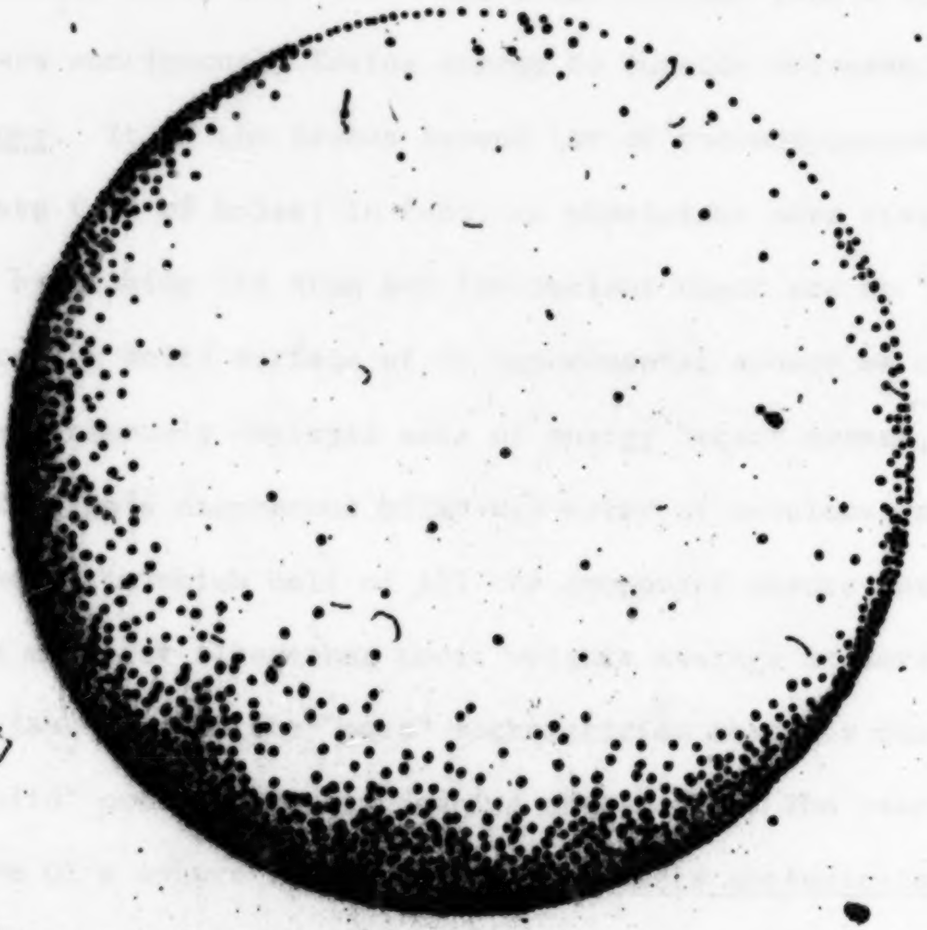


Figure 10

two absolutely divided sections of universe. This scheme is a typical perpetual motion machine because it completely defies what physics has found experimentally to be the case. All local systems (and a sphere is a local system) are continuously losing energy to outside universe. This is called entropy. It is the famous second law of thermodynamics. All local systems are full of holes; in fact, as physicists have discovered experimentally by probing the atom and its nucleus there are no "solids." As we probe into the solid surface of an experimental sphere we come to the atoms as very remotely deployed sets of energy "star" events, and we find we're dealing in a diaphanous milky-way array of nebulous "abstract" mathematical events in which half of all the component events have negative-weight wherefor altogether their weights average at zero -- and there goes the last hope of the "pure" mathematician that his non-solid abstraction "solid" concept had any meaning whatsoever. The best definition that we can have of a sphere is a plurality of events approximately equidistant in approximately all directions from one approximate event. That is the way that we begin -- axiomatically -- to tentatively restate our fundamental definitions of experimentally encountered systems and their internal and external relationships. They are really just childish descriptions stated in terms of our direct experience.

(FIGURE 11, p. 166) Another thing that we are always told, which scientists and engineers as yesterday's schoolboys as yet accept, is that in both Euclidean and non-Euclidean geometries the pure mathematicians say that you can run a plurality of lines through any one point. The engineer puts a point on paper and takes his straight edge and painstakingly draws line after line (approximately) through (approximately) the same point. And he assumes this to be both theoretically and realistically

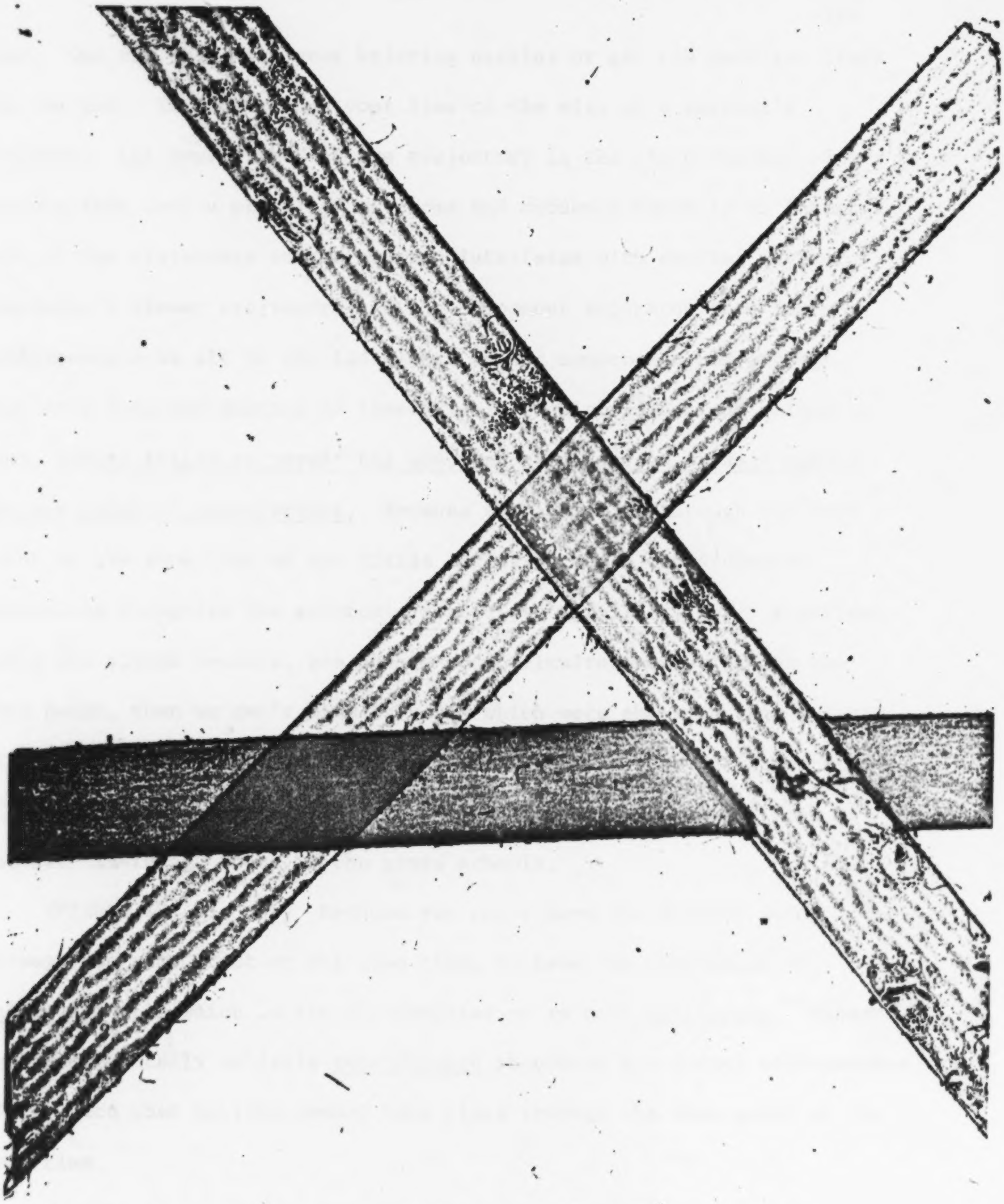


Figure 11

done. But try this with your knitting needles or get the smallest lines you can get. In fact reduce your line to the size of a neutron's diameter. Let your "line" be the trajectory in the cloud chamber of a neutron shot into a plurality of atoms and suddenly there is an interference of the trajectory as the neutron interferes with another nuclear component's linear trajectory and the component separates into further subcomponents as all of the individual atomic components now diverge angularly from one another in identifiable angular directions unique to each, having failed to permit the neutrons simultaneous passage through the one point of interference. Because they can't go through the same point at the same time we get little angles by which cloud-chamber physicists recognize the subatomic particles. If lines, which experimentally are always vectors, are unable to go simultaneously through the same point, then we can't have "planes" which were absurdly thin wafers of solids. Thus we find that we are dealing with a very different kind of a universe from the one that we were told about and the children as yet are "learning" about in the grade schools.

(FIGURE 12, p. 168) Because you can't have two actions going through the same point at the same time, we have the phenomenon of reflection with which we are all familiar or we have refraction. Those two experimentally reliable interference phenomena are direct consequences of the fact that actions cannot take place through the same point at the same time.

(FIGURE 13, p. 169) Now, something we are all familiar with. One of the first surprise experiences in each young life is seeing somebody hitting something at a distance and realizing that they, the observers, are hearing the hitting event somewhat after they see it.

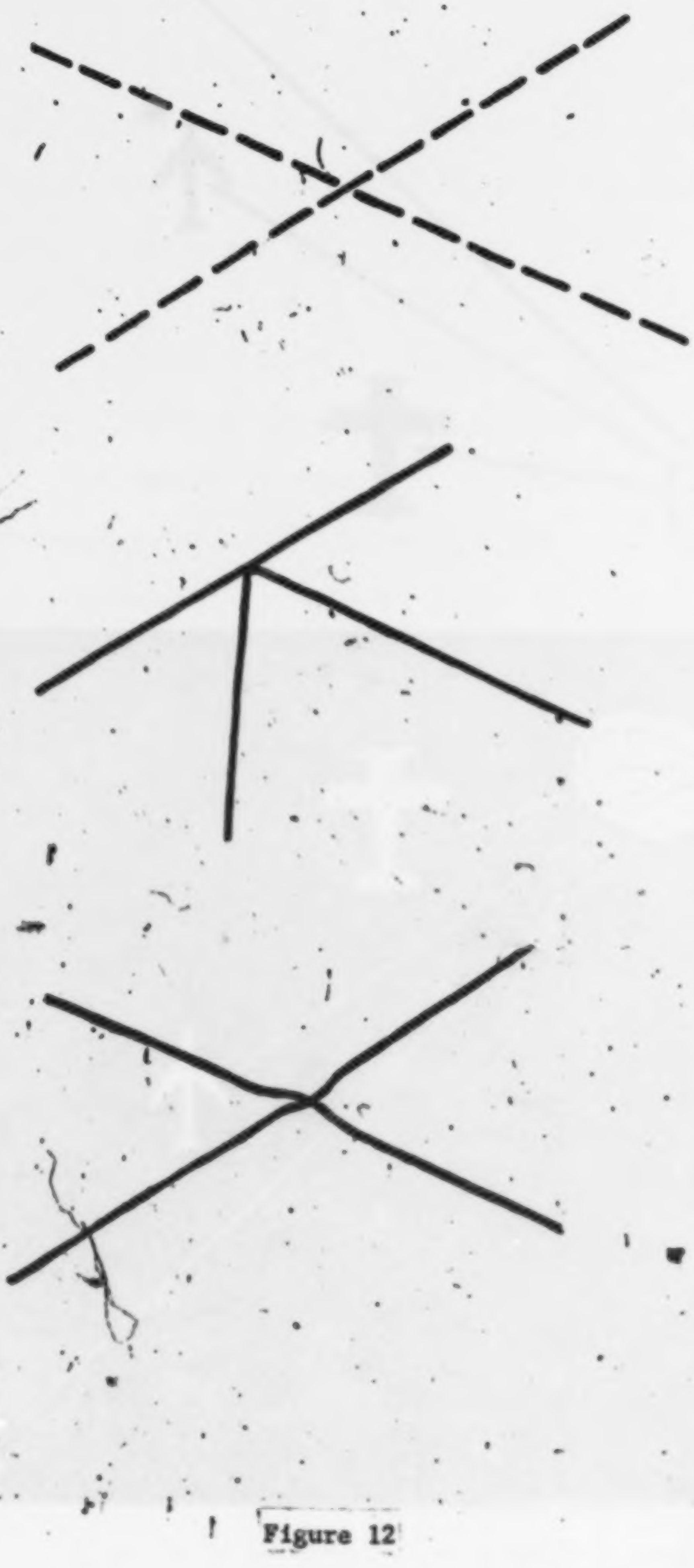


Figure 12

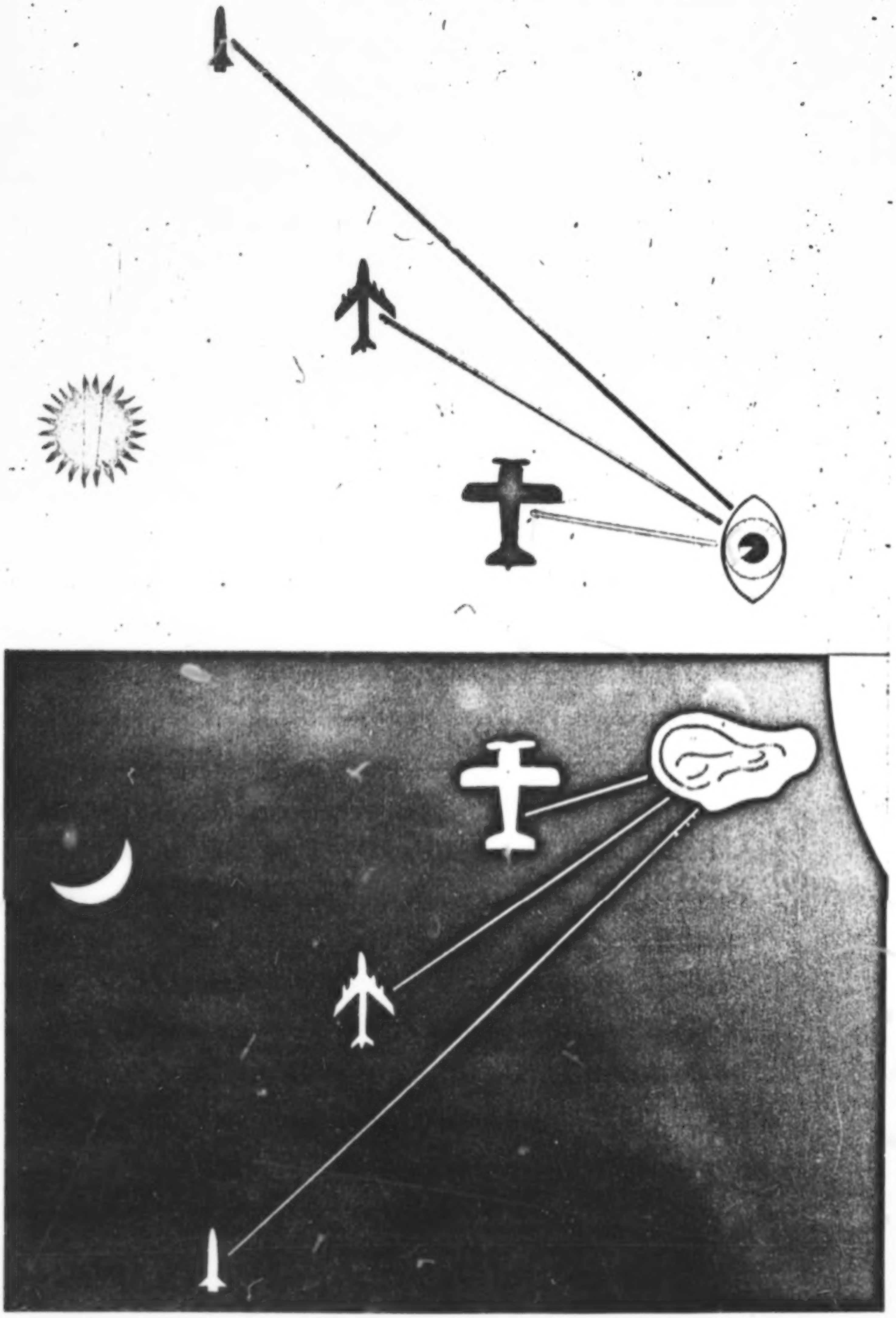


Figure 13

Up to this time, the children thought that all their faculties were *simultaneously* and *instantly* coordinate and operating at equal velocities. Einstein showed that neither *simultaneous* nor *instant* are valid, i.e., experimentally demonstrable. In World War I with many airplanes in the sky, we began to realize that we were hearing them in this direction and seeing them in that other direction. Then as the planes got bigger and faster and flew higher, we began to experience enormous distances between where we thought we heard them and where we thought we saw them. The highest airplanes we can see with our eyes, as little glintings in the sun, are flying at about 40,000 feet or only about 8 miles out from the surface of the earth, and 4008 miles out from the center of the 8000-mile diameter of the earth. The 8 miles is a negligible distance only one-thousandth the Earth's diameter. The highest orbiting of manned satellites has been at 380 miles outward of the Earth's surface. This is a distance which is only one-twentieth of the Earth's diameter -- equal to an inch away from a basketball's surface. 1965 man hasn't as yet gone "far out." Our nearest star, the sun, is 92 million miles. And it takes 8 minutes for the light to come from the sun to us. Then the next nearest star is so far away that it takes days for the light to come to us. Our eyes do not tell us the different distances of the stars in the heavens which seem to be in a great spherical bowl array at apparently equal radial distance from us. The stars seem utterly motionless because when objects move at a great distance from us, we cannot see their motions. The stars are all moving at nebulous velocities but the interpositional relationships in respect to our lifetimes seem changeless. We do know but do not sense that we are looking at many stars that haven't been there for sometimes millions and sometimes billions of years. We do not have any conception of what the true geometrical interrelationships of those stars might be to each other. Their most economical interrelationship patterning might be a surprisingly regular geometrical pattern. The chaotic array is the consequence of differentially delayed information from very great distances.

(FIGURE 14, p. 172) We send up four rockets, at 1/2 second apart, and their after-images are approximately simultaneous. So, we say that we see four rockets "at the same time." The illusion of simultaneity is one of the most important illusions for us to consider. Musicians may be able to comprehend nonsimultaneity better than do others. Einstein emphasized the importance of attempted spontaneous comprehension of the nonsimultaneity of all the events of universe -- a concept akin to our discovery that in our universe none of the lines can ever go simultaneously through the same points. In the realistic concept of the nonsimultaneity of events of universe, we lose forever the conceptual validity of the static pictures which man had assumed in accord with Newton's norm of "at rest." People say, "What is the shape of the universe?" and "What is outside of outside?" The question assumes that everything in the universe is actually insimultaneous static array with no consideration of all the myriads of stars that just aren't there, and haven't been for billions of years. What Einstein is telling you is that none of the events occur at the same time. There is some illusory overlapping of events from special eclipse viewpoints but we are dealing with a universe of completely nonsimultaneous events. There is no inherently composite picture of "May Day in Moscow, 1923" and the inside of a brand new juke box in an Atlantic City hotel in New Jersey, Christmas Day, 1965. There is no inherently logical montage of these nonsimultaneous unspecified

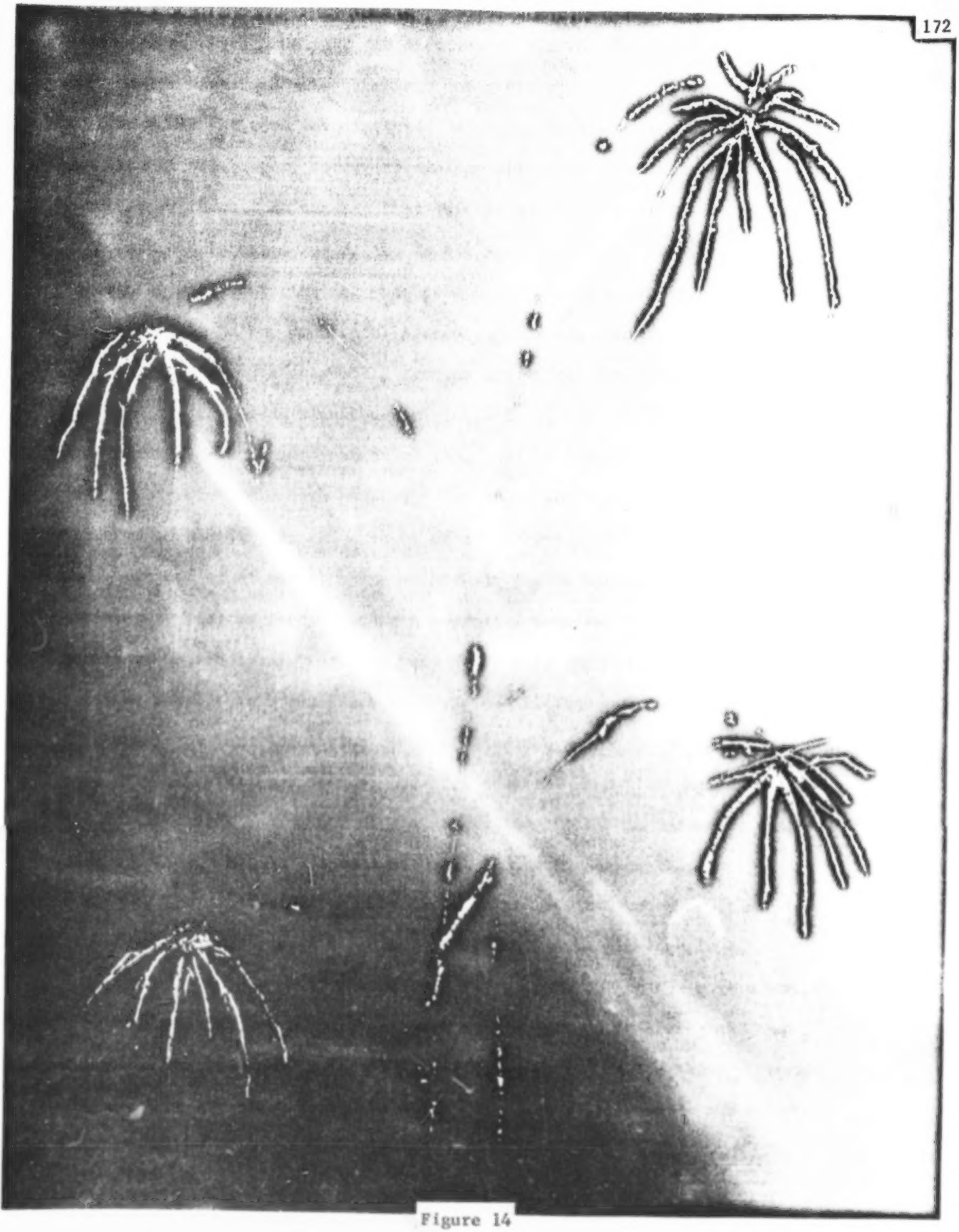
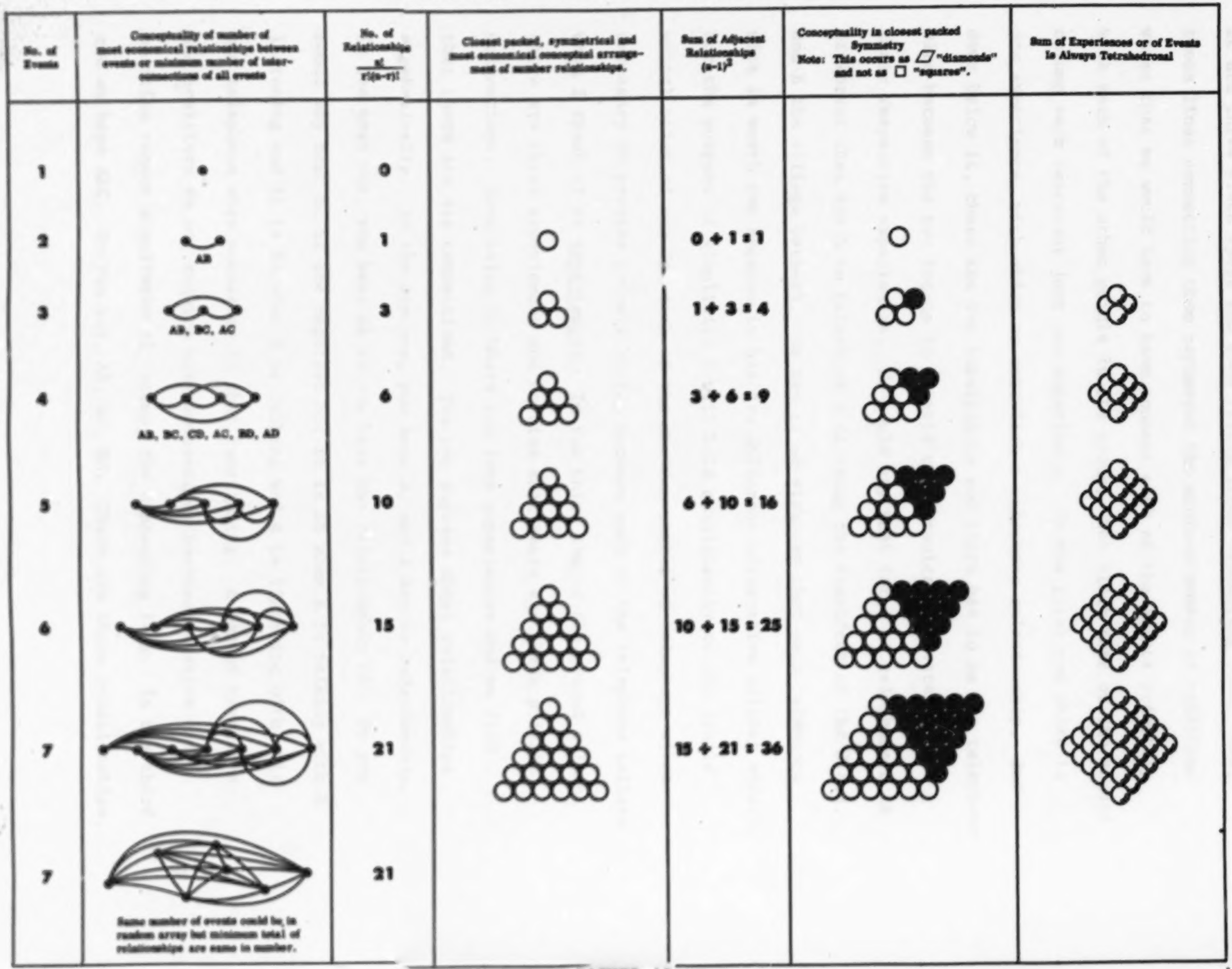


Figure 14

viewpoint concepts. We take the dictionary, all the dictionaries, of all the languages and make them into one great big book. In that book we'd have all the word formulatives: accruing to all attempts of all men through all history to try to explain all their nonsimultaneous event experiences. We can say that this is one big composite dictionary with only the latest words of the latest year left out. That's like saying the word universe. But you cannot put all those words together simultaneously in one meaningful sentence. Nor can you even open one page and comprehend a coordinate meaning out of all the words. Nor can you read all the words simultaneously. In fact, you can only deal meaningfully -- with one word at a time. And by the time you finish treating one you have to begin with another. And so we get a sequence of events. There is no validity in the concept of a universe of nonsimultaneous events as a unit and simultaneous shape -- with an inside and outside. It becomes exciting to realize that we are not logically required to formulate a simultaneous shape universe. We need not bother any more about what is outside, because what you think that you see outside may now be inside, etc. So there is no inherent inside or outside of the aggregate of universe's ages of nonsimultaneous events. We find that the word "in" expresses a direction towards the center of a specific body. "In" is unique to individual bodies but "out" is common to all and "out" has no shape. Inside-outing of nonsimultaneous event relationships from heterogeneous time viewpoints of universe is inherently shapeless, ergo nonconceptual.

(FIGURE 15, p. 174) I find this chart to be one of the most exciting I've been able to put on paper. There is a column on the left-hand side where you just see the numbers 1, 2, 3, 4, 5, 6, 7. In the second column you see just one black spot. Below it you see two black spots and below

UNDERLYING ORDER IN RANDOMNESS



No. of Events	Conceptuality of number of most economical relationships between events or minimum number of interconnections of all events	No. of Relationships $\frac{n!}{r!(n-r)!}$	Closest packed, symmetrical and most economical conceptual arrangement of number relationships.	Sum of Adjacent Relationships $(n-1)^2$	Conceptuality in closest packed Symmetry Note: This occurs as ▱ "diamonds" and not as □ "squares".	Sum of Experiences or of Events Is Always Tetrahedronal
1		0				
2	AB	1		0 + 1 = 1		
3	AB, BC, AC	3		1 + 3 = 4		
4	AB, BC, CD, AC, BD, AD	6		3 + 6 = 9		
5		10		6 + 10 = 16		
6		15		10 + 15 = 25		
7		21		15 + 21 = 36		
7	Same number of events could be, in random array but minimum total of relationships are same in number.	21				

Figure 15

it are three black spots and some little lines connecting them. Now, those lines connecting them represent the minimum number of telephone wires that we would have to have connect each of the points privately with each of the other points in its group. The black dots of the second column each represent just one experience. In the first row there is one experience, with which to establish a telephone relationship. But down below it, there are two experiences and there has to be one telephone wire between the two for us to be able to communicate privately about their respective experiences. We could say that for A to telephone B is different than for B to telephone A (A being the President of the U.S.A. and B the village barber). We may if we wish say that each telephone wire is worth two because it has two different alternative calling orders. For the purpose of simplicity I will hold consistently to the single mutual value of one for each of the minimum number of telephone wires necessary to provide private hookup between each of the telephone callers whom I speak of as experiences. In the third row of the second column there are three experiences and we find that there are three private connections. Down below it there are four experiences and we find that there are six connections. You can express these relationships algebraically. In the top one, you have A, and A has no relationship. In the next one, you have AB so you have the relationship AB. So you could say that BA is the negative but it is AB when A is talking with B listening and it is BA when B is talking and A is listening with only one telephone wire necessary to that functioning. A set of negatives and positives do not require more connections because negative and positive cannot simultaneously occupy the connecting line. In the third row we have ABC. So you say, AB, AC, BC. There are three relationships.

The fourth line has four experiences ABCD. And they could be expressed uniquely as AB, AC, AD, BC, BD, CD. So you get six. Then below that, I have 5 experiences ABCDE and they have 10 relationships, 10 telephone wires. Below that, I have 6 and they have 15 telephone wires. Below that, I have 7 and they have 21 telephone wires. So that the numbers of telephone wires are not corresponding at all to the numbers of experiences.

We also note that for three experiences there are three telephone wires and for two experiences one private wire but for four experiences six telephone wires. We can say that in the case of four or more experiences the number of private wire relationships is always greater than the number of experiences. We may also say that the minimum number of "private wire" relationships between any number of experiences is always $\frac{N^2 - N}{2} = R$ where N equals the number of experiences and R the minimum number of relationships. So the third column of our chart gives the number of $\frac{N^2 - N}{2}$ telephone wires and reads 1, 3, 6, 10, 15, 21, corresponding to 1, 2, 3, 4, 5, 6, 7 in column 1. Then in column four to the right, I have a series of circles in groups of the most economical and symmetrical arrays possible. The number of circles in these symmetrical clusters show how many telephone connections were necessary for that row's number of experiences. So to come down to the second line reading across, we have two experiences. And we see that one telephone wire and it says "one" and I have one little black line circle in the fourth vertical column. In the row below that we have three experiences and three relationships. So I have three circles in the fourth vertical column and they make a little triangle. On the fourth line there are four experiences and they have six relationships so we count the little circles: -- 1, 2, 3, 4, 5, 6, also making an equilateral triangle. We come down to the line below where we have 5 experiences and they have 10 relationships, and you count the little circles in the triangle -- 1, 2, 3, 4, 5, 6, 7, 8, 9, 10. So in the one below, we have 6 experiences and 15 relationships and you count the circles in the triangle and you will find that there are 15. In the row below where there are 7 experiences there are 21 relationships, count the circles in the symmetrical triangle and you will find that there are just 21. $\frac{N^2-N}{2} = 7^2 = 49 - 7 = 42 \div 2 = 21$. Now it is very interesting that the *picture of the relationship is always a triangle*.

Then I would point out that those numbers 1, 3, 6, 10, 15, 21, are numbers which if you associate any pair of adjacents add to a number of the second power, e.g., the 1 with the 3 makes the number 4 which is 2 to the second power. If you associate the 3 with the 6, you get the number 9 which is the second power of 3. So that you find in combining any two of those sets of relationships adjacently, they make what we call the second power. We used to call it a "square," but I made a most economical space picture of it and you will find that the circles close pack as *diamonds* and not as *squares*. Then in the right-hand column, we have stacks of those triangles of circles which represent the numbers of fundamental relationships. The stacks of triangles are like stacks of cannonballs, and they make a tetrahedron. So we can say then that *the sum of the relationships of all of our experiences is always tetrahedonal*. It is pretty exciting then to discover this extraordinary, omnisymmetrical tetrahedonal sum of all our experience interrelationships. We can say correctly to human beings trying to understand number relationships of arrays that seem to be chaotic as with the stars in the sky that all the interrelationships of all stars you are able to count in the sky, are always symmetrically triangular. This has to be. Therefore, what seemingly is disorderly on first appearance turns out to have this extraordinary order. And the sums of interrelationships of all the experiences of each of our lives is always tetrahedronal, and all the relationships of all the component events of universe are always tetrahedronal.

We've heard the popular way of talking about man and the universe (the Life magazine sort of story) which starts universe off as an astronomical aggregate of primordial ooze in some kind of vast nothingness. Somehow or other out of this enormous amount of chaos, in which the scientist finds that random elements are always increasing ergo becoming ever more chaotic until the random elements suddenly gell in an inexplicably orderly way and we have all the extraordinary things like daisies, diamonds, and moons. Then it is also said that the scientist wrests order out of chaos. This implies that there were extraordinary scientists standing off somewhere from the primordial ooze to suddenly make the daisies, diamonds, and moons. The legendary scientist is a magician and, therefore, he is a great benefactor of society.

Every great scientist who has made a great discovery, has noted somewhere in his letters, manuscripts or diaries and in his recorded talks with his friends, just what he had first thought might be going on in certain events of nature which had excited him into making an experiment. According to the great scientists' own records, their formulations, their hypotheses about what might be going on always turned out to be very crude as compared to what they actually found to be the operative patterns in nature which always disclosed an extraordinarily sublime, a priori orderliness. In finding that the sum of all of our relationships always add to one, neat complete, closest packed tetrahedron we understand why the scientist had to find orderliness.

During the early days of World War II scientists began to find their narrow fields of specialization beginning to overlap one with the other by virtue of the powerful instruments and the increasing numbers of abutting specialists. The biologist found himself suddenly overlapping the area of the chemist and the chemist found himself overlapping the area of the physicist. This brought about all the inter-hyphenating of the sciences such as in bio-chemistry, and so forth. Now the micro world scientists all find themselves so overlapped as to realize that they are in one world with everywhere the same sublime orderliness. And the orderlinesses of various aspects of nature are all interrelated, so they realize that they are dealing in just one great sublimely coordinated comprehensive accounting system employed by nature. Nature is not only orderly but the orderliness is rationally accountable in pure principle. And pure principles have no beginnings or endings. Therefore, we are not dealing in universe that has to be pictured or explained by a beginning and an ending. The experiences may be a chaotic array. But the interconnections are orderly. What we mean by understanding is apprehending and comprehending all the interrelationships of the set of experiences. Understand is symmetrically tetrahedronal.

This is as far as I will go in the pictures. I hope that I have introduced some generalized principles which have some relationship to music; for instance, the wave phenomena, the precessional phenomena and so forth; the omnidirectionality with which we are really dealing. I am quite confident because I have been exploring it for a long time, that nature has just one coordinate system.

In 1917, I found myself asserting that I didn't think that nature had a department of chemistry, a department of mathematics, a department of physics, and a department of biology and had to have meetings of department heads in order to decide what to do when you drop your stone in the water. Universe, i.e., nature obviously knows just what to do, and everything seemed beautifully coordinate. The lily pads did just what they should do, the fish did just what they should do. Everything went sublimely, smoothly. So I thought that nature probably had one coordinate system and porbably one most economical, arithmetical and geometrical system with which to interaccount all transactions and transformations. And I thought also that it was preposterous when I was told that real models were not employed in advance science, because science was able to deal with nature by use of complete unmodelable mathematical abstraction. I could not credit that universe suddenly went abstract at some microlevel of investigation, wherefor in order to be able to deal with the physical universe in the most advanced stages of frontiering you had to deal entirely with abstract -- formula, unmodelable mathematics. As we acquired larger microscopes and larger telescopes, I found that models always showed up. And men satisfied with their abstract preoccupations didn't bother or didn't seem to know how to explain the emerging pictures of the obviously systematic but strange, often asymmetrical but sometimes symmetrical models. I thought then that if we could find nature's own coordinate system we would understand the models and we would be able to develop much higher exploratory and application capability. In chemistry atoms were associating and dissociating in beautiful whole simple numbers arrangements: such as H_2O, or whatever the combination, chemistry seemed to avoid irrational fractions. Everything was accountable in simple and whole numbers. I felt that if we ever found nature's coordinate system, it would be very simple.

I am confident now that I have found that coordinate system because I have submitted it to bodies of competent scientists. This last October, I met with competent scientists of all the related fields of physics. I made comprehensive disclosure of the ramifications of the coordinate system which I have discovered and explored for a third of a century. They accepted the coordinated system which I disclosed as probably being nature's most efficient means of accounting those of nature's generalized relationships which I tended to identify by the coordination system.

The omnirational coordinate system which I have named synergetics is not an invention. It is purely discovery. I am quite confident that with the complete and simple modelability of synergetics that it is going to be possible for children at home with proper documentaries coming to them and making their own models, to do valid nuclear physics formulations at kindergarten age. With that fundamental structuring experience and sensing through models children will be making experiments that discover why water does what it does, etc. They will really understand what a triangle is and what it can do and does. The obsoleting educational system taught people to think in "squares," and to measure in terms of "inches," "squares" and "cubes." We've come to assume that a cubical or rectilinear house has structural integrity. If you make a cube with little sticks and rubber joints, you'll find that cubes always collapse. They have no structural integrity whatsoever. We find ourselves started out on all the wrong axiomatic bases. When we use tetrahedra to account nature we are three times more efficient with energy than when we account in cubes. And that is what nature does.

In this total interprecessional set of events that I have talked to you about, I have stressed that where men think of themselves as most scientifically advanced, especially in pure mathematics, that I find them dealing in axioms that no longer hold true. What they are doing does hold true in relation to that axiom. But inasmuch as they didn't start with axioms disclosed experimentally by nature they are dealing in non-universe, and are playing perfectly good games and I love them for doing it, but they are playing games that are completely irrelevant to what we and nature are doing and need to do.

I am confident that in the world of music and in the world of art, human beings have attained much spontaneous and realistic coordination. Artists are really much nearer to the truth than have been many of the sciences.

I wasn't surprised when under the authority and funding of the National Defense Education Act, the Science Advisor to the President recently persuaded the White House to spend some of the science-aimed educational funds on an exploration with art educators in New York. They had their meeting in New York University about six weeks ago and brought together some of the best (in my estimation) art educators in the country as well as some good artists. It was realized in our nation's seeking for scientists that they were only getting people who were good methodologists, who could expand or refine what was already proven, but they had no ability to conceive of as yet entirely hidden and previously unthought of conditions and relations of nature nor to explore and use their minds imaginatively. That is where the word "creative" came in. It was hoped by the scientists and the President that by going to the art educators, they might be able to discover in the knowledge and experience of art educators just how children suddenly conceive in sublimely pure and simple yet original patterns. The scientists and the President wanted to know what really constitutes and motivates and detonates the imagination of bright creative children, as well as of the inspiringly resourceful teachers who have the imagination, power, strength and conviction to go along with the children's original conceptioning. It is interesting to discover that our National Defense, having found the academic world of science per se, to be only a methodological system of researching and rehashing already proven phenomena, now discovers that academic science is running into a dead end. Because our scientists are unable to maintain or exceed the world pace of evolutionary development, our whole nation is losing its leadership pace. We have suddenly to turn to the artist. Art educators themselves had found that there was an extraordinary relationship between the conceptually brilliant child and the human being teacher whom the child found was not frustrating it but was accepting and fostering the child's curiosity and need to deal with its interference-born original questions.

In your musical education world and in your meetings of this week, I think it important that you realize that within the next ten years the world of science and the world of seemingly very pragmatic affairs may be turning to the world of music for leadership in fostering the spontaneous development of the most powerful coordinate capabilities of evoluting life. Rather than being a pleasant side show for the more serious central affairs of economic life, you who deal with the music of the universe and the innate coordinate capability of man to tune in the music of the new life, may be recognized as dealing with the sensitive mainspring of life itself, because of which you may find yourselves called by society to perform its most responsible tasks.

3.3. Orientation

In the Orientation Session, Consultants were introduced to the assembled conferees. The Conference program and procedures were discussed. In addition, the purposes of the Conference were further delineated by the Director as follows:

Dr. Maltzman: For some time now, we've been hearing and reading a great deal about the "revolution" going on in education.

As music educators, we do not need, rather, we should not need, the revolution to justify this Conference. We've been in need of a revolution of our own in music education for some time. I'm certain all of us present know this to be the case. The concerns you've expressed to us in our contacts with you have greatly expanded and reinforced our own notions in this respect.

We are concerned with this revolution for many reasons: as educators we should keep abreast of new developments in the field of education generally; as music educators we must be concerned with the possible effects this revolution may have on our own field and discipline, music education.

Coming as we do from every part of the country, and from every sort of educational climate, it is most likely the case that the revolution has different meanings for each of us. There may be some who have not yet felt its effects. On the other hand, for many, the pressures have been great.

In a very real sense then, the purpose of this Conference is to help us understand the nature of this revolution and its implications for music education.

Two aspects of this revolution demand our careful attention. First, we must be aware not only of the new "media" as such, but of the new understandings with respect to instructional procedures and educational technology. Second, we must be aware of the new understandings and techniques with respect to dealing with the content of learning.

Examine the "new math," or the "new science" and you will see operational examples of these two aspects.

What does all this mean? When we see that students are able to learn more content, better and earlier than was heretofore thought possible, it means that we must be concerned with learning, and not merely with instruction; that instruction must bear a greater sense of responsibility for learning.

Thus, in this Conference, our explorations must be concerned with basic questions.

How can the new media help us produce the musical skills and learnings in our students which we believe are necessary for literate musicianship? How can the new media help us in making our instructional procedures more effective? What new ways for dealing with the content of musical learning are suggested by the new media and the new technology? Are we effectively realizing all the values, which for so long we have proclaimed as being inherent in music education?

I urge all of us to keep in mind that the very people we must sell as to the values of music in the educational market place, have themselves been through our music education processes. Shall we continue to sell, as we have in the past, with the same age-old, shop-worn, and generally unproven assertions of "life-goals"?

I'm sure we'd all like to have a new, more effective product to sell, the kind music truly deserves, the kind which is now possible. Perhaps, one day soon, we shall be hearing about the "new music."

4. REPORTS OF THE TASK FORCE GROUPS

4.1. Task Force Group 1 (Instrumental)

Report - Frances M. Andrews

The ability of a profession to maintain itself depends largely on perceived goals, established standards, and success in developing a competent, responsible, and dedicated profession. The future of a profession, in terms not only of maintaining but constantly upgrading its membership, hinges on its ability to perceive, identify, and evaluate trends, seek out new knowledge, and devise methods by which such knowledge may be communicated to the membership and its constructive application actively encouraged. The Educational Media Conference was a striking example of the latter.

It is not often that one participates in an event which signifies a turning-point in the direction of an entire profession, yet it was clear to this writer that the Educational Media Conference constituted such an event, that its influence on the future of music education would be massive; that, in fact, we were glimpsing the face of the future.

The content of the Conference involved: music education, the subject content; learning theory, the psychological content; and educational technology, the "hardware" with which to facilitate the learning of our subject. Emerging from this composite was a profile of the future of music as an art and a subject discipline so closely merged with psychology of learning and technological developments as to make a greater impact on music education than has been dreamed in the past.

As Recorder for Task Force Group 1, particularly charged with considering instrumental music education, it was my responsibility to record the opinions of this group both in terms of sessions with the Consultants who met each group separately, and as reflection of the group's reaction to the general sessions, which presented R. Buckminster Fuller's magnificent, imaginative assault on the traditional _modus operandi_, Stanley Foster Reed's perceptive challenges, the salutory, succinct remarks of Francis Keppel, a number of films dealing with programed instruction in its various aspects, and several panels. Part I of my report consists of general comments; Part II contains thirty statements, on which group consensus was obtained, developed from TPG 1's sessions with Conference Consultants.

Part I

1. Everywhere in the Conference there was evidence of a desire to recognize, cherish, and nurture the musical individuality of the human being--to identify ways of developing his musical nature and abilities, to make full use of the individual's innate talent. This was impressive, and it seemed to imply that the day of submerging outstanding individual talent to meet the needs of an average mediocrity was passing.

2. There appeared to be agreement that we as music educators must structure models of musical behavior, musical competence, before significant progress will be made in advancing the teaching of music. The implication was clear--we must determine answers to such questions as: what constitutes good tone on a particular instrument, or good singing tone; how should these be produced; what is the best way to manipulate a particular instrument for a specific purpose or task? We were told that we must identify and specify such behavior; specialists in the

theory of learning will then be able to help us obtain it.

3. An over-all implication rode high in the structure of the Conference and the comments of the conferees. This constituted recognition of a need for close collaboration between music education and workers in the areas of learning theory, instructional media, sociology, and music education, all of which are part of the behavioral sciences. Certainly this Conference brought home to those in attendance the fact that music education cannot stand alone, that to sustain and strengthen itself there must be utilization of the vast knowledge existing in related fields.

4. There was consensus among the delegates that each of the Consultants with whom the five groups worked made an excellent contribution, and an enlightening one, to the individuals in attendance. Inclusion of a closed session of Consultants alone, for the purpose of eliciting reactions to the five different groups with whom each met would have been interesting; perhaps this was done as part of the Conference evaluation. (If not, it might be worth the effort to obtain reactions from these Consultants in terms of what they believe the future of music education to be as a result of their five days with the various groups.)

The foregoing statements are those of approval on the conduct of the Conference. The following are suggestions of a few ways in which I believe the Conference might have been strengthened:

5. Provision for ideational cross-fertilization among the five groups might have been built into the Conference. Perhaps there was a certain amount of this at meals and coffee breaks, but this same weakness evidenced itself in the sessions listed as panel discussions,

which evoked a minimum of participation from the group. Discussion groups made up of participants drawn at random from the delegates might have helped, and possibly could have brought out into the open some of the matters which were discussed covertly. For example, why was the Conference structured entirely in terms of operant behavior (Skinnerian) psychology? This matter was discussed endlessly by delegates, but little recognition of it was noted in open sessions, except for C. R. Carpenter's intrepid statement on the need for a more eclectic approach. (See Section 5 for Dr. Carpenter's remarks at the Panel Discussion which Dr. Andrews requested be appended to this report.)

6. The arbitrary definitions assigned to each Task Force Group (instrumental, general music, and so forth) were limited to an impractical extent, with the result that certain groups were unable to stay within the definitions, or categorical classifications, of the task area assigned. Broader definitions of terminology in such applications might have been advisable. Behavior and content--can these factors ever be separated?

7. More efficient use of time might have been achieved by having each Consultant present his ideas in one general session, then running a greater number of, and possibly more productive, discussion sessions with the various groups. I am venturing here that the actual time for discussion with each Consultant in terms of the time during or following his presentation was so limited that in the case of several Consultants the group had almost no time in which to arrive at statements of position, need or status. The opportunity to formulate was quite limited in relation to proximity of the session with the Consultant.

4

Speaking in a broad sense, it may be said that the entire Conference was the response to a need for music education to immerse itself in the new knowledge increasingly available to us as musicians and educators, and as such was a magnificent effort both in direction and dimension. Twenty-five years hence, the profession may well look back upon December 7-11, 1964, as a pivotal event of the greatest importance. The efforts of all of those concerned must be applauded whole-heartedly.

Part II

Position Statements

A1. An area constituting common ground, with great potential for cooperation, exists between music education and the behavioral sciences.

A2. There are many approaches, viewpoints and sets of principles in psychology and from the behavioral sciences which are important for music education. (From statement by Dr. C. R. Carpenter)

A3. In developing programed learning in music, we must consider the nature of the desirable response, decide on the desirable musical behavior, and "reinforce it to maximize the probability that it (a) will have a certain form and (b) will maintain itself." (Quotation from Dr. Harold Weiner, 12-7-64)

A4. Development of models (packages) of desirable musical behavior is prerequisite to planning. This leads into structuring a system that elicits desirable musical behavior. (It is essential to identify desirable musical behavior, then reinforce it.)

A5. Programed learning should not inhibit the pupil's creativity, but should (a) establish basic knowledge and skills, and (b) provide flexibility and freedom for the development of creative talent. "Programed learning should not get in the way of creativity." (Quotation from Dr. Harold Weiner, 12-7-64)

A6. We recommend that, in developing educational television and film material, the entertainment approach (or factor) be minimized, and the major factor of interaction between learner and information be stressed.

A7. We recommend that, in development of film and ETV material, it be recognized that the most important personnel are those individuals who know both the subject and the target audience.

A8. Programed learning, although useful for conveying information about music, can be used best in terms of transmitting musical knowledge and in developing skills. It must include the audio dimension.

A9. It is strongly urged that musical examples incorporated into visual media conform to the highest professional standards of musical notation, as did the Spohn and Carlsen filmed examples.

A10. We recognized the matter of copyright and royalty agreements as an area of great concern to music educators involved with producing and using films and educational television programs. Equitable copyright practice must be concerned with ready accessibility to all materials necessary for instructional purposes, as well as with consideration of the inherent rights of author or composer, and publisher.

A11. G. M. Torkelson Statement (12-10-64):

It is my judgment that enough gross-comparative studies have been done to prove that media, does, in fact, enhance learning, shorten learning time, increase retention, and so forth. This research is deemed to have run its course, and it is my judgment that further emphasis on gross-comparative studies will yield very little of added significance.

Media research today should focus its efforts on such problems as:

a. What are the characteristics of a specific medium which contribute to a specific kind of learning and learner?

b. How does one design a given medium to achieve a given task?

c. What kinds of media can be combined to accomplish certain objectives and to what degrees need they be combined?

d. How do learners perceive what is to be learned through various media--e.g., how does one learn from a picture versus learning from a graphic?

e. Given a set of learning conditions, can we generalize about the appropriate types of media, learning experiences, and physical environments which will meet those conditions?

The foregoing examples suggest that media research needs to "look inside" the media in order to develop the best kinds of media for each learning condition; that is, a taxonomy for media should be developed. Given the media taxonomy--developed through empirical and research situations--the teacher can then match the media to the learner's requirements.

Status Statement

^{B}12. To the knowledge of Task Force Group 1, a very small percentage of schools is known to be using programed learning in the instrumental program.

Statements on Need for Information and/or Research Recommendations

^{C}13. There is an urgent need for basic psychological and physiological information on the basis of which choice of musical instruments for individual pupils may be made.

^{C}14. A need exists for pre-conditioning pupils for instrumental training; this might take the form of programed learning.

^{C}15. There is a need for music educators to acquaint themselves with the production of self-made, simple films and video recordings emphasizing the learning results that they as individual music teachers desire.

^{C}16. We recommend that continued investigation of the educational potential of multi-media applications be carried on; e.g., coordination of dynalevel and strobocon, filmstrip and sound music, the multiple-beat metronome and the tachistoscope.

Statements on Need for Official Professional Action Recommendations

^{D}17. It is strongly urged that conferences of the type of the present Conference be carried on at all local, state, and national educational levels, as well as in all state and divisional units of MENC.

^{D}18. We recommend that under Title XI, NDEA, MENC officially recommend that representatives be appointed to attend the Institute for Media Specialists.

D19. We recommend that state organizations provide leadership in developing sessions for training music educators in the new educational technology.

D20. We recommend that, in our promotion of music instruction through the new media at state and local levels, we seek out the assistance of and cooperate with the newer media specialists, the educational television and radio personnel, and their professional organizations.

D21. We recommend that steps be taken to insure the training of additional music personnel for the organization, programing (content), teaching, and technical aspects of educational television and other media.

D22. We recommend that technical standards committees of musical organizations, state departments of education, and similar groups or organizations be concerned with developing minimum standards for the quality of, and specifications for, musical and electronic equipment.

D23. We recognize the need to stimulate research in all areas of music education, and the correlary need to disseminate research results through publication, with the cooperation of MENC state unit officers and state departments of education, who should actively stimulate research and the reporting of such research to MENC members and other interested persons.

Statements on Need for Dissemination of Information

E24. The results of the MENC Educational Media Conference should be published and widely disseminated.

E25. We recommend that increased attention be given to dissemination of information about good, locally produced films and other media, with the hope that this may lead to an increased interchange of materials and ideas.

E26. We recommend that information concerning 10-watt FM radio stations be disseminated, and that articles on this subject be published in the Music Educators Journal and other publications, presenting relevant technical and educational usage information. (Suggested periodicals: NEA Journal, AASA Journal, and similar publications at all levels.)

F27. We urge recognition of a need for single-concept films and film loops for instrumental instruction in the development of specific skills.

F28. We recommend that an overhead projector be developed by manufacturers with a stage sufficiently large to accommodate contact print transparencies of standard size (9"x12") music. We further recommend that publishers be urged to provide transparencies for coordinate use with the overhead (or other type) projector.

F29. We recommend that publishers be urged to provide recorded accompaniments (tape or disc) for their solo materials publications. This would constitute a desirable combination of printed and audio materials.

F30. Phonograph recordings intended for educational use should have the selections thereon separated by identifying bands of sufficient width to maximize ease of presentation.

4.2. Task Force Group 2 (Choral)
Report - Oleta A. Benn

1.1 Positional Papers:

Well structured and for the most part, clearly definitive of the positions which Conference members could expect the Consultants to take; good overview of devices available for instruction; first chapter especially helpful in clarifying for conferees the psychological principles upon which the programed instruction area activities of the Conference were based -- namely, the "operant behavior" approach or the Skinnerian interpretation of behaviorist psychology. Helpful in clarifying terms and language of scientific research -- often strange to music teachers and performers.

1.2 Current Status of Use of Media in Music Education as Reflected in Group 2 Meetings and Elsewhere:

Group 2 members were generally aware of the media demonstrated, only a few items of hardware seeming quite new -- the language master card carrier audio device, the wireless microphone, the multi-media control demonstrated at the U.S. Office of Education. Since members were anxious to hear the presentation of the Consultants, they refrained from taking time to describe their own uses of the media. Perhaps the Conference questionnaires will provide the evidence which could indicate that usage, since no time was available to Group 2 for meetings other than those scheduled. It was learned that one member of the group had written what is purported to be the first book of programed learning in music, and that another member had just concluded a use of the program most recently published.

In general, there was informal evidence of the use of recordings, tapes and tape recorders, films, filmstrips, TV, programed instruction and the overhead projector. One may not hazard a guess as to the extent of their use but the group was not naive.

Although cost was not to be considered, it is a grim reality to teachers. Consequently, one may not assume that a limited use of these media is evidence of either a lack of interest in them or a lack of sophistication. Also, a possible limited use of the visual media may be partially explained by the fact that musicians must be primarily concerned with the aural and are naturally hesitant to utilize that which is not the unique feature of the musical art.

1.3 Working Sessions:

Session 1. Dr. Raymond Wyman - TFG 2.1.

I. Demonstration of

- a. Overhead projector and transparencies;
- b. Language master -- short exposure, manual feed; record on cards with magnetic tape adhered across bottom;
- c. Auditory training system -- 22-channel tape recorder, headphones, microphones, portable wireless (works within a zoned area via use of aluminum tape loops for enclosure);
- d. Tape recorder;
- e. Record player -- stereo vs. monaural
- f. Radio -- 88-92 megacycles available to educational use.

II. Suggestions from Dr. Wyman:

1. Necessary to have technicians readily available to keep equipment in order.

2. Overhead projector:
   - should be permanent in room, not portable. "One uses well the equipment with which he is familiar."
   - commercially available transparencies;
   - can make own with special pens, etc.
   - erasure possible
   - overlays useful
   - should be mounted low so teacher and the "snorkel" are out of range of vision
   - requires high mounted permanent screen with "tilt" feature
3. Language master:
   - cards (blanks and some programed) available at $35 for 200 (catalogue of available cards)
   - can erase immediately.
   - records immediately
   - suited to short patterns -- drill has master and student tracks
4. "Tape recorders are work horses of the business."
   - single track tape for greater fidelity -- sacrifice fidelity for economy in dual
   - fidelity increased by good microphone and by playing through permanently installed speaker -- self-contained speaker not desirable
   - standardize on type of tape used
   - some 4-track tape recorders useful in same manner as the "minus-1" or add-a-track recordings
   - some $25 earphones superior to some speakers

- tapes do not get dirty or scratched as do records
- best to buy a reliable recorder from a local dealer who is readily available for servicing the machine

5. Make use of the 88-92 megacycle band in educational FM radio.
6. Central sound systems offer tremendous potential for recording and receiving; too often used only for official announcements.

III. Group became vocal only with demonstration of the language master, the only piece of hardware with which it was not in any degree acquainted. All other media were known in some degree by most. Opportunity to experiment with the language master and with the 22-channel tape recorder, in which fidelity is not yet commendable for musical purposes.

Session 2. Dr. Harold Weiner - TFG 2.2.

I. Central concept is to consider under what conditions we can accomplish desirable results in developing musicianship and musicality. Problem of precisely stating desirable results is burden of music educators. Once statement is made, psychological principles may be employed to assist in developing effective instructional procedures. "Stimuli as stimuli have no strong power to evoke desired behaviors, musical behaviors, in the absence of some action which is taken, following the presentation of the stimulus, which has desirable consequences."

II. Discussion by Dr. Weiner:

1. Current Skinnerian psychology emphasizes the importance of the reinforcing consequences which follow responses for the development, maintenance, and alterations of

repertories of musical behaviors.

2. Merely reinforcing correct responses may not be sufficient to effect desirable musical repertories. The learner must be made aware of differentiations between correct and incorrect. Errors should be made "costly" (i.e., should be penalized). One must arrange appropriate response cost (error penalty) to response payoff (reinforcement for correct responses) contingencies in order to effect desired musical learnings.

3. Yardsticks are arbitrary. Teachers decide on desirable musical behaviors, and on musical standards, including appropriate bandwidths for flexibility (variation and transfer). Operant conditioning principles may then be employed in setting up instructional procedures to effect such behavior. Programed instruction should provide for
    a. effective behavioral adjustments to rapidly changing musical contingencies;
    b. Successful handling of musical mistakes.

4. Musical behavior (vocal behaviors included) is quite complex. Frequently, it may be possible and desirable to break such behaviors down into behavioral components (the separate skills, knowledge, and so on) before dealing with the total behavior.

5. With appropriate understanding of conditioning principles, and the musical learning content, more effective procedures for developing or modifying behavior may be possible. Uncertainty in these areas, however, may lead to uncertainty

in musical learning. Do not forget that a teacher can be as good a device as anything else.

6. Weiner suggests that music "appreciation" may be the result of massive reinforcing consequences which, in part, become internalized. Analysis of behavior a la Skinnerian concept leaves room for the internal event. The subjective is not ruled out. It is merely assessed via its observable referents.

   Warning: It is dangerous to say that things not now observable will not be observable tomorrow. Operant techniques are frequently designed to convert private events for experimental analysis.

7. The teacher can be an effective reinforcing agent in producing learning.

III. Implication for choral music:

1. Skinnerian psychology applied to our work, especially in lower grades with uncertain singers, suggests that there may be approaches other than having such singers participate with a group in order to develop differentiated behavior in singing. The need of individualized instruction for the uncertain singer is apparent. The Ohio State film suggested a possible individualized approach for dealing with uncertain singers.

2. One must try to be sure that desirable musical behaviors are appropriately reinforced while instruction in singing and listening is being given. There must be some overt sign or musical response in order for reinforcement to be effective.

Session 3. Dr. Philip Lewis - TFG 2.3.

I. This session seemed an extension of our session with Dr. Wyman. We received a listing of equipment on display and were directed to the following sourcebook:

Audio-Visual Equipment Directory, 1964 - National Audio-Visual Association
1201 Spring Street, Fairfax, Virginia

Demonstration of the various devices, with suggestions for their installation and use.

Much group interest in:

- cordless microphone - band men on field
- conductors in festivals, team teaching, etc. (especially for large choral groups of several hundred)
- overhead projector -- with tachistoscopic attachment and Hammer notation slides (should have a built-in transparency maker)
- multiple beat metronome -- use in basic rhythmic training, establishment of poly-rhythmic patterns
- magnetic paint -- two coats or more make any surface magnetic

II. Suggestions:

1. Attempt to use language lab equipment -- may prove need for such aids in music, but with higher fidelity than now possessed.
2. Plan for A-V media space allotments and proper wiring conduits in any new building project. Space cannot be had after building is completed.
3. Use of these media may act positively upon the negative attitudes of some teachers and administrators toward the separation of class groups into small instruction

units such as vocal ensembles or specialized groups and may help to support present attempts toward individualized instruction.

4. Prediction (by Dr. Lewis) that education will become, to a greater extent, a matter of individualized and self-directed instruction.

III. Group reaction:

Will the effect of increased individualized instruction result in an isolation of children from each other as they sit in their laboratory booths without the human contacts children have always seemed to demand? How will this affect their attitudes toward each other and toward the musical, social and humane values we have considered good and necessary? It would seem that the crucial problem here is effecting a proper balance between the individualized and group experiences. It was agreed that the media shown to us must not be permitted to obscure the purposes which they are expected to serve and that they must not become ends. Musicians are well acquainted with the urge which leads children to fingering clarinets, striking drums, ringing bells, etc. The purpose of the invention of the instrument (making music) is sometimes lost in the zeal for manipulating it. There is a similar possibility in the use of these devices. Only through careful research and testing can it be known how valuable (if at all) each device might be to the field of vocal music.

Session 4. Dr. Ray Carpenter - TFG 2.4.

I. Observations on films and TV by Consultant:

1. Present rationale of use of TV and films is that they are supplementary to instruction. Dr. Carpenter stated that they should be the "dependable core" around which instruction is built.
2. "TV is expanding enormously and failing miserably." Medium is not so important, as the effectiveness of its use.
3. Inclined to believe that TV instruction should be limited to two courses per day or not more than "from five to eight percent of the total course units of instruction." "Too much of any thing can be disastrous. Exceptions might occur if the quality of the program is so very high that it warrants greater exposure."
4. As to success of TV instruction, it was summarized by saying that comparisons made of the work of the same teacher in class and on TV, "where the experiment was well-designed," there was no observable difference in result.
5. Curve of resistance to TV teaching increases as it moves toward collegiate faculties. (Recorder's note: We failed to ask if there is any curve of resistance noted in student reaction.) This was supported to some degree by opinion of TFG that the elementary schools in their areas do not consider TV an intrusion.
6. Redefinition of roles of people involved in instruction. Necessity of interaction between learner and the information (or "program" or instruction). Teacher "intercepts"

flow. TV cameras have stressed teacher rather than instruction.

II. Recommendations of Consultant:

1. Establishment of research and dissemination (R and D) centers for improvement of instruction.
2. Institutions must share such centers. Cost of individual R and D centers too great for any one school to establish.
3. Course improvement cannot take place while course is under way. Improvement must be made in laboratory. (Courses may be field tested in school systems.)
4. Present modes of expansion are commonly conceived in linear terms -- multiple highways, two-level bridges, greater school space, etc. Eventually space will not be available. Expansion must come via communications.
5. Recognition of fact that since complexities are different the devices are variably valuable.
6. Arts faculties should be prepared for a balancing thrust in arts and humanities; science, math and languages are presently emphasized.

III. Reactions of group:

Need for quality ETV and films suitable to the establishment of a standard by which teachers can judge the quality of aids submitted for their use:

- not convinced that teacher's role is so unimportant
- Consultant stressed that success in TV instruction depends upon the utilization domain and the production domain

- recall that Consultant pointed out (on panel discussion) that there are other interpretations of behavior than the Skinnerian.

Session 5. Dr. Robert Slaughter - TFG 2.5.

I. Observations by Consultant:

1. Textbook industry now "educational publishing" (multi-media).
2. "Enrichment" materials now called "satellite material."
3. "Systems of instruction" result of -- analysis of learning activities -- selection of media -- combination of these into "package" or "kit", consisting of books, films, filmstrips, discs, tapes, maps, charts, etc.
4. Believes that the hardware has not controlled the materials and development of programed instruction.
5. Musicians must decide whether their subject or any phase of it can be subject to the "systems" approach.

II. Group reaction:

1. Great interest in display of French "package" and of programed learning texts. Two authors of such texts present, one of whom remarked that "there is enough evidence to convince us that learning does not take place without reinforcement."
2. Enthusiastic reference to Educational Media Index, sponsored by Educational Media Council and published by McGraw-Hill, with suggestions that the volume on Music Education can be purchased separately for $4.50. Entire index containes 14 volumes. Publishers anxious to hear from groups with specific plan for instructional packages.

14. Recommendations - For Future Steps in Research, Development, Demonstrations and Dissemination Activities:

A. Research:

1. "Great need for research in the utilization of educational media." (Dr. Slaughter)
2. Need for designation of certain films and ETV programs which can serve as a standard by which teachers can judge the quality of such aids.
3. Comparison of curve of student reactions to TV instruction with curve of resistance by faculties.
4. Determine to what degree, if any, the use of visual stimuli impedes or aids the development of aural perception in young children.
5. Need for more adequate tests for determining musical potential -- to be used in guidance; to be used diagnostically.

B. Development:

1. Recommend to equipment companies that the principle of the language master be adapted to use with standard tape recorder.
2. Could language master provide for a longer tape card which would permit slightly longer patterns to be used?
3. Usefulness of overlay transparencies which could be used in teaching physiology of ear and vocal mechanism.
4. Need for greater fidelity in audio aspects of many of the media demonstrated.
5. Need for instructional films or TV to be produced with nationally recognized experts who will demonstrate:

a. effective choral directing techniques
b. methods of achieving blend, balance, phrasing, diction, tone quality, etc.
c. vocal or choral styles
d. choral literature
e. classification of voices
f. changing voice

6. Production centers for such study under guidance of MENC.

C. Demonstrations:

1. Instructional films (as outlined above) -- useful for in-service training.
2. Use of the present structure of MENC in arranging demonstrations of new media and their proper use in state, divisional and national conferences. Such aid could be given via county or area meetings as well.
3. Cooperation of manufacturers in demonstration of equipment for benefit of faculties or departments.
4. In-service demonstrations of all media, to be sponsored by school systems for benefit of teaching staff.

D. Dissemination:

1. Colleges can give teacher candidates some exposure to new media; certain states require course work in visual aids, and most schools already use some of the media as instructional aids.
2. Continued use of the MENC Journal and the Journal of Research in Music Education for publication of pertinent articles.

State journals also would serve this purpose.

Notes:

1. A colleague involved in "Project English" supported by the Cooperative Research area of OES (HEW), reports that they are making an "earnest effort to bring the student face to face with the literature itself (texts or books) instead of running away from it" via intermediate processes.
2. The first article "Technology's Challenge to Education" in the Saturday Review for December 12, 1964, is very timely for those of us who participated in the Media Conference.

1.5 Summarizing Remarks: (12-11-1964)

The Conference appeared to consist of two elements, (1) a consideration of media and (2) the consideration of a set of psychological principles underlying their use.

Task Force Group 2 was increasingly amazed at the vast array of audio-visual aids or "systems" available to teachers. The predictions of future innovations were as overwhelming as one might expect in our technological age.

Our enthusiasm for the presentations of this remarkable week did not, however, obscure the fact that these media are not ends in themselves but are means available to us for presenting those aspects of musical instruction which they can properly serve, and their success is mainly dependent upon our thought and skill in using them.

At present, their use seems more highly developed in areas of aural and rhythmic training, certain aspects of theory, and in basic keyboard experience.

The Consultants repeatedly indicated that the burden of selection and use of media rests with the teachers, one Consultant going so far as to say that "the teacher may also be a good device."

The implications are that in-service programs and teacher education programs must give attention to the development of ability in judging and using this new multi-media approach as a modern tool of instruction.

Group 2 was further impressed by the faithfulness with which these media can implement the Skinnerian interpretation of behavioristic psychology and the learning theory it supports. It would be highly beneficial if we immediately could be exposed to the uses of the same media based upon other psychological persuasions of which we were reminded in the Tuesday evening session. (Ed. note: Only the programed instruction area Consultants were "Skinnerian".)

Such an experience being impossible at this point, we must show ourselves to be responsible members of a profession by making our own personal investigations into recent psychological and pedagogical thought, clarifying our own concepts of music education, and applying the new technological advances where they can best serve our purposes.

An additional recommendation might be that we consider the observation of one of our Consultants -- that "there is a great need for research in the utilization of educational media."

Also, there already is an excellent opportunity within the present structure of MENC to demonstrate some of the new media in the state, divisional and national conventions. The pages of the Journal and the Journal of Research in Music Education are always open to articles of merit.

The members of our group are deeply grateful for the opportunity afforded them by those whose time and energy made this Conference possible. Our special gratitude is expressed for the superlative calibre of the Consultants. We feel as though we have returned to school for a short while and the feeling is beneficial. It is difficult to imagine anything but good coming from our week of work, which was well planned for achieving the maximum of attention, stimulation, and even exhaustion.

Therefore, it is a final recommendation of our group that after a period of reflection and possible experimentation with the ideas generated by the Conference, that this same group return to Washington for a session in which we can formalize our recommendations, submit whatever data we have accumulated, and identify specific problems which can be dealt with via formal research. Such action would preclude any decisions or recommendations which might be premature.

4.3. Task Force Group 3 (Music Theory) Report - Charles Leonhard

I. Definition of Music Theory

Members of Task Force Group 3 agreed on the following definition.

A. The term, music theory, refers to a musical discipline which involves the organization of experiences to produce a set of skills and understandings embracing listening skills, sight singing, rhythmic harmonic and melodic dictation, keyboard harmony or improvisation, style, idiom, form, and writing involved in harmonic and contrapuntal settings, scoring and composition.

Music theory deals with every aspect of the score and includes the conceptualization of the musical sounds represented by the score.

Experiences with music theory should be organized not only in connection with discrete courses in music theory at the high school and college levels but also as part of music classes and activities at all levels of the shcool program.

B. Music theory, as such, embraces every aspect of music study and teaching; it is impossible to deal with any aspect of music without dealing with music theory. Music theory, therefore, is intimately involved in the area of each of the other four task force groups.

II. Current Research in Programed Musical Learning

Although traditional procedures of teaching music theory still predominate in schools and colleges throughout the country, much of the current research in programed musical learning is in the area of music theory.

Significant research studies of programed learning in music theory include:

A. Charles Spohn, Self Teaching of Music Fundamentals, The Ohio State University.

B. Edward Maltzman, Analysis of Musical Behavior, Harvard University.

C. Walter Ihrke, Automated Rhythm Training, University of Connecticut.

D. James Carlsen, Aural Perception Training, University of Connecticut.

E. Robert A. Barnes, Fundamentals of Music, a Program for Self-Instruction, The Ohio State University.

III. Results of the Conference

After many years during which authorities in music education have placed primary emphasis on Field theory of learning, the emphasis at the Conference on operant conditioning theory and other theories was timely and stimulating.

The Conference revealed:

A. Significant approaches to the development of a learning-teaching technology in the area of music theory.

B. The need for research concerning the effect of individually controlled programs of learning in music theory.

C. The possibility of using operant conditioning theory in further analysis of learning processes and teaching procedures in music theory.

D. Some of the limitations of operant conditioning theory in analyzing the comprehensive behaviors which represent desired outcomes of theory instruction.

E. The need for more precise analysis and definition of the musical behaviors that should result from theory instruction.

F. The need to clarify through behavioral analysis, abstract concepts such as appreciation and aesthetic experience.

G. The need for more precise determinations of desirable sequence in music learning.

H. The need to differentiate musical learning from the consequences of musical learning and to relate one type of result to the other.

I. The need to emphasize educational media as means to precisely defined objectives.

J. The need constantly to search out new media and new uses for older media.

K. The need for greater cooperation and interaction among learning theorists, specialists in educational media, research specialists, teachers of music theory, composers, arrangers and performers.

L. The need for research which evaluates all current theories of learning in their application to the teaching of music theory.

M. The need for research to determine the amount of repetitive learning required in developing music theory skills and concepts.

N. The need for research to determine how musical taste develops.

IV. Suggestions for Implementing the Results of the Conference

A. Wide and systematic dissemination of information concerning educational media by regional and state music educators organizations, the state supervisors organization and college and university music departments.

B. Dissemination of the results of this Conference on a continuing basis.

1. Conferees and Consultants should be made available for area, state, divisional and national meetings to participate in similar programs which would have as the main objective the dissemination of information gained during this first Conference.

2. The Office of Education should be encouraged to continue, in cooperation with the MENC and other national professional music organizations, conferences of this type with many of the same personnel involved so that a higher level of development and achievement may be attained.

3. Materials from this Conference should be distributed on the widest possible basis.

C. The following considerations which characterized this Conference should guide further conferences:

1. careful structuring;
2. specific focus;
3. advance preparation;
4. sufficient time;
5. elements
    a. Keynote Speaker;
    b. Consultants;
    c. individual involvement;
6. careful evaluation and dissemination of results; and
7. continuity of effort and a sense of progression from each conference to succeeding conferences.

D. Requirement by colleges and universities of a course in educational media for music education majors.

E. In-service courses in educational media for music teachers.

F. A regular column on educational media in the Music Educators Journal.

V. Some Music Tasks Suited to Programed Learning

A. Pitch recognition.

B. Interval recognition.

C. Singing in tune.

D. Learning the fundamentals of music.

E. Taking dictation - melodic, rhythmic, harmonic.

F. Recognizing musical styles and idioms.

G. Sight singing.

H. Analyzing harmonic progressions.

4.4. Task Force Group 4 (Music Literature) Report - Thurber H. Madison

Introduction

This is a report of the deliberations of Task Force Group 4 with an assignment, in part, to relate the business of the week to the specific problems in the teaching of music literature. Because of the structuring of task force sessions around the rotating visitations of five Consultants, each of whom dwelt upon selected phases of educational media, problems relating to the teaching of music literature and the use of educational media in the solving of these problems were for the most part secondary and incidental. Despite this, the topic did come up for serious discussion and some pointed and important directions in the teaching of literature were indicated. Because all topics had a way of fading in and out of the general discussion (even when conducted by the various specialists) no attempt is made in this report to treat separately the various work sessions nor any sequence of topics. The nature and conduct of all sessions, on the contrary, were in a setting of a total conception of the enterprise of music education. Probings in depth in the separate topics were frequently interrupted by a return to some of the overall objectives and philosophy of music education as a totality. Frequently the discussion broke over the boundaries of music education into the related fine arts and to philosophies of life itself. These constant alternations between depth and breadth lent strength to the deliberations, it was felt.

These deliberations, therefore, were alternately focused upon (1) the media themselves, (2) the learning theory and rationale underlying the selection, use and construction of the media, (3) operational principles and techniques of media construction, (4) sources, nature and use, and distribution of the media, (5) problems in the teaching of music literature,

(6) some implications for the future, and (7) the developing of certain overall perspectives.

This report will be organized in the light of these focal points although, again, it should be pointed out that they were far from taking place in any prescribed order.

Attempts at orientation.

At one of the opening sessions each Task Force Group was asked to define for itself the nature and range of the subject area to which it had been assigned. At another time, there was a request to concentrate upon the rationale of the educational media themselves and to avoid getting bogged down in deep questions involving curriculum and philosophy. Very frequently the suggestion was made that since operant theory is based upon the identification and modification of specific and observable behavioral responses, we should attempt to define exactly what we want the students to do by way of desirable musical behavior. For each of these directions, there was a pull in the opposite direction which seemed to suggest a series of polarities. If there were, indeed, these polarities, surely there possibly could be present a certain unity of opposites, a continuity between these polarities. The group found, very soon, that no rationale of programed learning could be sustained without a view of the curriculum itself and without a view of what we wanted the whole music educational program to do for the student. No identification of specific and observable responses had any validity without reference to what we felt constituted the total organization of the musically knowledgeable and literate human being. Hence, the shifts in the discussion.

The task of defining the term music literature posed problems. Was it the music as heard? Was it the performance of music, its "appreciation" or even its creation? Was it the music in the literature class or the music in the general music class? Was it literature about music? After a while the question became more or less academic and a final definition, considerably simplified, ran as follows: Music literature is any literature used in the teaching of music at any level. Such literature included literature both of and about music. In the strictest sense, of course, music literature consists of the actual music studied and heard. Literature about music is written to serve as means to the better understanding of music and the inclusion of this kind of literature was felt necessary in the Task Force discussions. By common understanding, the definition did not include literature involving either the pedagogy or the philosophy of music education. Conceivably it could have included philosophies of music. On this definition the group was then concerned with the bases for the selection and use of music, whether it was in the general music class or in the performance program, in the listening program, for movement response, or for its creation. This expansion of the topic, of course, brought about an inevitable overlapping with the areas of the other Task Force Groups.

The Media Themselves -- Operation, Types, and Rationale of Use

A description of the different types of media is left for other sections of the complete report of the Conference. The lectures and demonstrations served to impress upon the group the immense scope and variety of the media. They ranged from a complete educational "package" of different kinds of media (films, filmstrips, texts, etc.) -- all integrated and coordinated and which could cover the work of a whole semester and even possibly a year. At the other end of the scale was the single concept device lasting anywhere from a minute or less to five or six minutes in length. In between there appeared a tremendous wealth of materials and devices enough to bewilder the uninformed educator. As one Consultant put it, "we already have more gadgets than we know what to do with. The answer to this allegation is, of course, to search for the particular medium and a particular device chosen from that medium which meets a particular instructional problem. When such criteria are laid down, much irrelevant equipment (it was called "hardware" during the Conference) is discarded. Often when particular uses are prescribed, the list of available media becomes quite decimated. Thus arose two frequently made points: "don't be awed or misled by the hardware" and "don't place any more confidence in the hardware than its real use merits." At the same time, we were told that each medium has its own characteristics. Care must be taken to understand these characteristics in order to choose media wisely.

It was also brought out that reputable and worthwhile instructional media and programed learning devices require tremendous resources and much experimentation, imagination and subsequent testing in the schools before they can fully be relied upon. The reasons why such media must serve such definite purposes are found in the attendant learning theory which was identified as operant behavior theory and this is the subject of the next section of this report.

The Learning Theory Behind the Media -- Operant Behavior and Technology

One of the interesting points brought out about operant behavior theory is that it is, at the same time, both a theory and a technology. This has an advantage over many systems of educational philosophy in that the latter invariably requires separate mediating theory of curriculum to link educational philosophy and classroom practice. Further discussion on these points is provided later in this report. Operant behavior theory consists of two phases. First are those psychological constructs of operant behavior theory which serve as pure description. A sought-after behavioral objective of education is first postulated. The eliciting of such behavior should have with it certain consequences which, themselves, tend to reinforce and maintain the behavior. If modifications of the original behavior are sought, the consequences are so arranged as to begin to modify the original behavior. At this point, the theory becomes a technology of educational practice and then takes the form of programed learning. Both phases of the system are so closely related that they must be considered almost inseparable. In this sense, the theory is a technology and the technology is a theory. The Task Force Group was given instruction aimed at clarifying these points, thus making for a still better conception than was found in the original position papers which were mailed to the delegates prior to the Conference.

Attention was focused upon the necessity for defining behavior patterns which are not only part of the overall aim of music education but which are capable of being modified through intelligent programing into the mature characteristics of the musically literate human being.

One of the problems of this paradigm is that in its application to animal learning, the experimenter can work with primary wants associated with the preservation of life processes such as hunger, thirst and bodily warmth, to mention but a few. Learning can be structured through the giving or withholding of these primary wants. In human learning, however, there are many secondary or learned responses which, in effect, act as primary wants. Thus, the many learned or acquired characteristics, diversified in man as they are, must be taken into account in any system of operant behavior as it is applied to human programed learning. Moreover, each human being has his own pattern of such wants which affect rather powerfully whatever consequences may develop when he is taught anything. Powerful factors in such conditioning, it was brought out, are the attitudes and conditioning which parents develop in their children. Particular attention was paid to the undesirable effects of many aversive consequences (positive in a negative sort of way) imposed by society and in the "natural" behavior of students which tend to counteract and nullify other consequences of a positive reinforcing nature. Such attitudes as music as "sissy" activity and certain music as representing the snobbish status of the so-called "higher" classes fall into this category. Competition of other interests, while not acting as an aversive consequence, still tends to nullify or counteract many of the desirable concomitants of successful music experience.

Again, since each individual carries about with him his own unique pattern of wants and desires it becomes a matter of treating each member of the class as an individual and of considering any class simply a group of separate individuals, so far as operant conditioning is concerned.

One of the characteristics of the new educational media is their extreme flexibility. Through wire or "wireless" transmission, they can bring instruction to the learner wherever he is. Thus, in communities where acculturation is a problem in public housing, information of a cultural nature can be "piped" into the buildings through open or closed television. Some colleges have experimented with bringing in televised instruction to the dormitories or to the individual student's study carrel. The remark was made that possibly in the future, educational institutions can get along with less classroom space by bringing in such instruction to dormitories or other facilities. In their "packaged" state educational media become instantly available and may be repeated as often as is necessary for the learner's benefit.

Although there is a technology which is a part of operant theory there do remain certain principles and procedures in the development of programed learning devices which need to be treated in a separate section and to this our report now proceeds.

The Technology of Operant Conditioning -- Principles, Techniques and Applications

Throughout the week, the close and reciprocal relationship between the basic learning theory of operant conditioning and the operational and technical aspects of programed learning became clearer and clearer. What follows in this report, however, are some supporting principles and techniques necessary for application to specific problems of instruction. These principles, it appeared, apply not only for those structured devices known as programed learning (teaching machines) but also to those aspects of private or class instruction as conducted by a live instructor. The principles of such learning are the same for both live and formalized programed learning. In the case of the live instructor, the teacher himself is the device. He, himself, programs his own instruction and, in this sense, the teacher becomes a teaching device. This idea, conceived in the light of the demands of programed instruction of any kind need not constitute any insult to the dignity of the teacher. In fact, the teacher's insights, skills and general instructional artistry should enable him to modify his procedures in a much more flexible manner than any known device in programed learning. The teacher can manipulate and even invent the many consequences which can and do occur in any intelligent system of instruction.

A list of such principles as is given here would probably fall far short of the total number of such concepts. Those which were discussed are as follows:

a. Programed learning is based on the identification of specific behavior patterns and a clear understanding of the effects of their consequences (previously stated).

b. Programed learning requires the earliest possible occurrence of reinforcing consequences to the original desired behavior sought for.

c. Programed learning must have built into it definite proportions of success and failure.

d. Programed learning in music (when both audio and visual elements are present) should keep the audio and visual in proper balance.

e. Programed learning is helped when certain amounts of "humanizing" elements are built into the system.

f. Programed learning has built into it valid elements of student evaluation.

A discussion of these principles follows.

The identification of specific behavior patterns.

The nature of the behavior pattern sought may require a good deal of research. No superficial or over-generalized construct will suffice. Often this will require the cooperation of the student whose introspections may go far in defining the true nature of his sought-for behavior. It may take a good deal of inquiring to determine what the real reinforcing consequences of a given kind of musical behavior might be.

The necessity for early occurrence of the consequences.

Most instructional programs do not provide either timely or adequate reinforcement sufficient to sustain, much less modify, desirable musical behavior. Response to sound, either as speech or music, needs immediate verification. Checking the responses of students even at the end of a class period provides too great a delay for effective and economical learning. Even the time necessary to find answers in the back of a book is considered by some psychologists to constitute too great a delay in reinforcement.

In the case of ear training, immediate verification of the student's perception is highly desirable. This is done quite effectively in the private lesson, but in a class in theory or dictation, checking the responses of the students after the class is over and presenting such information at the next class period is "stale" news, psychologically speaking.

Building in "success" and "failure".

An important principle of programed learning is that the student as he goes from "frame" to "frame" or from any systematic progression of required skills or understandings should meet with success (acting as reinforcement) as much as possible. This means that each increment of skill or knowledge must be determined beforehand so that the steps are within the student's capabilities. In the immense amount of research necessary for a first-rate job of programing the student himself, in effect, helps to build his own program. His problems of comprehension and mastery help set the pace for programing.

Even the matter of successfully coping with failure is taken into account and some program builders deliberately introduce elements of failure (wrong response) about ten percent of the time.

The Orf method of improvisation through the use of the pentatonic scale was cited as an example of built-in "success" because of the well-known fact that it is easy to improvise using such a scale. Almost any tonal sequence sounds pleasing to the ear and the student, thereby, avoids the pitfalls of poor melodic progression when he tries to improvise using the diatonic scale. Another example of built-in success is the practice, long established in instrumental instruction, of introducing known melodies for the beginning instrumentalist. The old Gestalt concept of ego-involvement (if one may, indeed, introduce a concept from a competing psychological system) was built largely on the notion of the student's identification with a given task and the difficulty of the task adapted to the range of the student's ability.

Balance between the audio and the visual.

This principle applies only when both audio and visual are present in the learning situation, as in films or television. It is a principle perhaps unique in music instruction. If a film on ear training is properly developed it should not develop the visual at the expense of the audio. In directed listening to music literature, the audio is the important phase, and whatever is presented visually must reinforce the audio and not compete with or overpower it. However, the visual can reinforce listening through the use of moving symbols and diagrams of the structure of the musical composition. However, if a performing skill is the objective, the balance between the audio and the visual could be reversed. It was agreed, therefore, that the balance between the audio and the visual (where both are involved) is a matter of determining the nature and objectives of each learning situation. In the case of television or film on folk music of other lands and cultures, the visual, again, may play an important part in determining the cultural value of the learning situation. Someone observed that he had rarely, if ever, seen notation on television or films. Musical notation is, of course, a visual aid to musical conceptualization. The matter of the improvement of musical notation as it might improve musical conceptualization was discussed.

"Humanization" of programed learning devices or systems.

The impersonal instructor in a regular class tends to be a dull bore unless this is compensated for by extraordinary gifts in other directions. Early developers of programed instruction were responsible for much boring material. Today program builders are injecting expressions of encouragement and approval and some occasional humor and other incidental remarks which tend to vitalize and motivate learning whereupon the learner (presumably) feels that he is being treated more like a human being. Scientific accuracy of programing must at times give way to such human interest treatment.

Evaluation as an integral part of programing.

Attention was called to the fact that by its very nature and structuring, programed learning programs have built into them ready-made and accurate indices of pupil evaluation. Successful responses, as they are recorded by the student, constitute valid indices of pupil progress. In this connection, it should be noted that the whole technique of construction of achievement testing for at least 30 years has been based on this technique of relating the tests to the basic behavioral objectives of instruction. The later movement of programed learning has, of course, focused attention on this important relationship between achievement testing and the basic objectives of instruction.

Sources, Nature and Use, and Distribution of the Media

The need for being able to have information on sources of educational media was felt. Films and kinescopes often come from companies who sponsor musical programs over television. Thus, the Ford Motor Company is known to have bought four Omnibus films and made them available through dealers. Bell Telephone has made available some of the programs of the Bell Telephone Hour through free film distribution and has done this for some time. More recently three of the Bernstein programs have been made into films for educational purposes by Bell Telephone. It was suggested that often local radio stations loan tapes (audio only) as an accommodation to local educational institutions.

For human resources such systems of learning often require capable specialists or certain combinations of specialists. Here, again, the limitations of the individual teacher to produce such organized instruction, and even the limitations of a single educational institution were recognized. The conclusion was that often, for best results, centers of research need to be set up whereby teams of specialists and scholars with large physical and technical resources can work. The recent inclusion of the Julliard School of Music in an educational effort to locate and evaluate a wider repertory for school music is an example of an emerging trend of bringing high level scholars into a closer working relationship with the teachers in the public schools. Such development has gone on in the sciences and mathematics with tremendous improvement in public school teaching.

Perhaps the term "the new math" may yet be paralleled with "the new music." Care needs to be taken that the consequences of such effort reinforce and help maintain the new movement.

At one point in the discussion, one of the Consultants opined that "actually to do a good job, a person should spend a year organizing just one course." This, naturally, is an administrative impossibility but it does call attention to the necessity for some instructional programs to be developed through the facilities of centers of instructional research situated strategically throughout the nation. A survey of existing media as they exist today suggests that for some time programed instruction will be mainly in book form. Programs for 1963 suggest that about 80% are in book form. The time may come, it was felt, when the narrative aspect of texts may be discontinued to some extent and texts may take on more of the characteristics of carefully controlled informational systems with a view to producing more concrete forms of altered human behavior.

Periodical literature is coming more and more into the text book field. The Music Educators Journal has, especially since the student membership plan was initiated, become a very valuable text in college music education classes.

Television as an educational medium was described also as a distribution system. Films also take on this characteristic. In such a view, therefore, all other media are in reality simply distribution systems. The chief basis for such media is the mind of the competent educator who is behind every successfully conceived piece of educational equipment. The dazzling appearance of some of our educational "hardware" often obscures this fundamental truth.

The development of the educational media field has had an effect on the products of the publishers. Today, many publishers have branched out into films, records and other kinds of instruction. A publisher today, therefore, is more than a purveyor of books. The term "publisher" today implies a purveyor of a large assortment of educational equipment.

Possibly the distribution of educational media is still primarily in the hands of the publishers. Other agencies for distribution are the audio-visual departments of colleges and universities. Specialized commercial firms also are distribution agencies. The suggestion was made that, with the great need for still better and widespread distribution of media, other affiliated educational agencies ought, perhaps, be organized.

In the selection and purchasing of informational distribution systems in school buildings some advice was given. The traditional central audio system, so common in today's school buildings, was criticized. Money could be better spent, it was argued, for better controlled and directed equipment more suited to specific instructional needs. As it is now, too many central systems are simply instruments for the distribution of routine school announcements with some attempts to play music throughout the building. The fidelity of such systems is quite often inferior for music quality reproduction.

On the other hand, it was suggested that in matters of tape recorders possibly some centralized equipment for the making and playing of tapes might be desirable. Instead of having a number of inferior tape recorders scattered throughout the building, it might be better to purchase a high quality tape recorder which could be placed in a central location with music rooms wired to such an instrument through appropriate cables and provided with high quality speakers.

Expense is not necessarily the criterion of the excellence or usefulness of certain educational media. Much depends upon what kind of a job needs to be done and often an inexpensive machine is excellent if it serves a definite purpose. An institution could easily overbuy in matters of equipment.

Strong encouragement was given throughout the Conference for music educators to investigate and try out new ways of utilizing those media which are already existent. The point here is that many media are invented for general broad purposes and that it requires the insights of specialists in the different fields of teaching to devise specific uses of these media in keeping with the unique learning situations peculiar to these areas.

It was brought out that innovations on our campuses in the use of the newer media started when specifications for new buildings were laid down. This pointed to the need on the part of architects and administrative heads to plan carefully for future eventualities in the development of educational media.

It was stated a number of times that the present state of engineering design is sufficiently advanced that music educators can have virtually any sort of teaching aides they desire if they will only decide what they want and ask for it, preferably through their professional organizations. In this respect music educators have been inexcusably inarticulate in the past, it was maintained.

Some Selected Problems in the Teaching of Music Literature

As time permitted, this Task Force Group tried to formulate a working definition of music literature which, as indicated earlier, was conceived as "any literature used in the teaching of music at any level." Dr. Slaughter, who spoke as a publisher, expressed the view that the music education profession has not set up clear-cut standards of content and coverage in music literature beyond insisting that it be of general excellence. Dr. Slaughter's point actually went beyond this reference to music literature. The whole publishing industry, he opined, feels the need for more directives from educational groups so that the publishers, in turn, may produce better educational materials. This lack of directive, the speaker pointed out, has made it difficult for publishers to risk much capital in the issuance of books on music literature. There was feeling in the group that this whole subject requires study, far more than could be given it during the week of the Conference. A recommendation was made (perhaps as a stop-gap measure) that since literature involves not only music of the past but of the present, there be a reasonable balance in the production of educational media in the music of all periods.

Until more definite directions are indicated for the systematic study of music literature in the curriculum, any development of educational media in this field is bound to be haphazard. More leadership in the profession in this respect was indicated. Also noted was the fact that until we are more articulate about what ought to constitute curricular directives in music literature, there can be no possibility of developing any standardized tests of musical literature in the field. It seemed also that the problem of "appreciation," even as an aesthetic component of musical education, is not unrelated to the problem of valid content and coverage of music literature as an important phase of music education in the public schools.

It seemed, furthermore, that if and when the answers to these problems are forthcoming, it will be possible to have a broader basis for the selection of music in the performing groups and in the general music classes in both elementary and junior high school. Criteria for the selection of music when performed by school organizations revolves too often on technical difficulty and a relevance to the social occasion where the groups perform. The commendable fact that some directors insist on high quality music does not quite eliminate the need for some kind of systematic approach to the selection of music from the vast resources now available. Some plans based on cycles of three or four years, depending on the type of high school, were recommended. Better answers to this curricular problem could, conceivably, have a great impact on educational film making in music. A criticism was made that many music films today are not directed specifically to problems of musical learning. They tend simply to be shows.

Reinforcement theory was related to the problems of the general music class. In the traditional content of the usual general music class the specific behavioral objectives required in successful operant behavior theory are notably lacking. Whenever these are lacking in the general music class there is comparatively little in such experiences for any valuable "consequence" or reinforcement. Identifiable increments of learning in most general music classes, therefore, are almost non-existent.

By way of contrast, it was pointed out there are many more reinforcing consequences attached to the activities of the performing groups. There was some question of the philosophical and educational validity of some of the customary consequences of the performance program but it was admitted that, whatever, the consequences were or where they led they were powerful reinforcers and tended to maintain and perpetuate the existing organization of the large ensembles in the school music program. This tended to point out the need for further inquiry into the rationale of the performance program.

Some Implications for the Future

The Task Force Group, in the limited time at its disposal for future implications, did come up with certain views. There was focusing around the following problems.

1. The role of educational media in the total music program.
2. Implications for re-training of teachers now in the schools.
3. Implications for restructuring teacher training curricula.
4. Problems of copyright protection.

Some members of the group questioned the oft-repeated assertion or claim that educational media and programed learning will not, and should not, replace the live teacher Yet it seemed that in some areas music instruction, through television, has actually done this. A warning was sounded that in our enthusiasm for such media we make sure that the beneficial presence of a live teacher not be eliminated from the classroom.

A better understanding of the role of educational media in music teaching will come, very probably, from better knowledge and identification of the specific behavioral objectives of music study and participation, and from the ways in which the educational media are brought to bear in developing such behavior. Once this role is established, a number of other issues will come into better focus. The personal attitude of the teacher toward the media could become modified and adjusted. The teacher can be fortified in the knowledge that some of his goals are met through the intelligent use of such media. He can be fortified with the knowledge that, perhaps in the noblest sense, he is the personification of an effective educational medium. Perhaps too much is said about the "sacred" relationship between teacher and pupil. The student should not always be relationally tied to his teacher's apron strings even in the elementary grades. The pupil could well afford, at times at least, to be on his own as he relates himself to the programing of educational media. Perhaps here is but one instance where the development of a technology of learning promoted in this Conference can become influential in the re-evaluation of our philosophy of music education.

There is a danger, if indeed it does not already exist, that the technology of the educational media could outstrip our knowledge of pedagogy. It was also thought that possibly there are more changes in the methodology of music education than there are changes in the content of musical literature.

Reference was made earlier that operant behavior theory is both a theory and a technology. This is not to say that operant behavior theory (and technology) can entirely do without a curriculum theory appropriate to its unique nature. Of course, in one sense it is or could constitute a kind of curriculum theory in its own right but a clarification of this problem and its relationship to the philosophy of music education must await further study. For despite this integration of theory and technology and the possibilities of formulating a curriculum theory around it, operant behavior theory must still stand between a sound philosophy of music education and the art and science of classroom and performance activities. Proof of this is found in the many references throughout the sessions for clearly defined behavioral objectives of musical instruction.

Implications for re-training of teachers now in the schools.

Through clinics and public meetings the issues and implications contained in this report may come up for further study. There is a tendency for some teachers to be "down" on something they are not "up" on. Strong recommendations were made that a thorough and vigorous program of information be provided teachers now in service.

Implications for teacher training institutions.

Considerable force was added to the recommendation that the training of future teachers include a thorough background in the understanding of operant behavior theory (and other theories) and the use of programed learning devices including films and closed-circuit television. Citing the principle that teachers teach as they are taught it was strongly urged that their college courses make use of as many educational media as possible.

Problems of copyright protection.

At the time of the Conference, legislation was still pending in Congress over the revision of copyright laws. The following statement is made in view of what seems to be the present situation. Future developments could make this statement invalid.

Any general law is bound to affect the music education program although perhaps the direction of legislation may be focused on the professional musician and the music industry. It would seem that two powerful forces are on a collision course. On the one hand are strong efforts to further strengthen the laws protecting the composer and his publishers. On the other hand is the tide of educational technology, all tending to the extensive proliferation of knowledge of and about music. On the side of the composer and creator there is the need for protecting the product of his creativity. Without protection, the well spring of creative talent could dry up. With excessive regulation, music educators could be so hamstrung that the educational program could be seriously affected. Flagrant violations of the copyright laws, however, were roundly condemned by the group. More enlightenment on the interests of everyone was recommended, the interests of the composer and creator on the one hand, and more enlightenment on the interests of the consumer on the other.

There is a danger, if indeed it does not already exist, that the technology of the educational media could outstrip our knowledge of pedagogy. It was also thought that possibly there are more changes in the methodology of music education than there are changes in the content of musical literature.

Perspectives

There was considerable reflective thinking going on during all of the sessions. Although not all of such thinking was on the same level of importance they are brought together in this section. Many of these products of reflective thinking have already been discussed under specific headings.

In many respects, it was felt that more questions were raised than were answered. This situation, itself, was felt to be desirable. The procedure of keeping all Task Force Groups "intact" in their separate meetings came in for commendation. It appeared there were many auditors in the nearby area who keenly desired to be a part of the Conference. As the days wore on, the Task Force Group advanced in solidarity, mutual understanding and efficiency of discussion. A vested interest in the final report became apparent and an agreement was reached that the report when published would have to have the approval of all members.

Some felt that, possibly, the field trips might have been better scheduled earlier in the week and become more a part of the orientation period.

Another opinion was expressed that there should be a lessening of the instructional lag between the experiences of artist teachers who pioneer in effective teaching and the appearance and availability of educational media which would reflect such teaching.

This report ends on a historical note. Until the recent past, and for a number of years prior to that, music education philosophy and practice has been dominated by Gestalt psychology and its corresponding learning theory. Accompanying this ascendancy has been a vigorous condemnation of almost every form of reinforcement theory and practice. It seems quite timely, therefore, to call attention to some shifts of psychological and pedagogical points of view. Instead of such global goals as better citizenship, self-expression, self-discovery and worthy use of leisure time with their greatly delayed consequences, operant behavior offers the challenge of more specific and immediate kinds of reinforcement. In the face of much interest and enthusiasm for the new educational technology it was urged by the Task Force Group that the merits of certain competing theories of learning not be overlooked to the end that the music education program in the schools have as its basis the most comprehensive theory of musical learning possible.

4.5. Task Force Group 5 (General Music)

Report - Roger P. Phelps

Introduction

"If a man does not know to what port he is sailing, no wind is favorable." This quotation from Socrates had a positive connotation for members of Task Force 5 attending the National Conference on the Uses of Educational Media in the Teaching of Music, held in Washington, D. C., December 7 - 11, 1964. New fascinating and challenging media were demonstrated and discussed, perhaps to the point of overwhelming a novitiate, but the practical application of many of these to general music was readily obvious. General music, it should be noted, was defined for purposes of this Conference as being concerned with musical attitudes and behaviors of the general public. The non-performance aspect was stressed, not to exclude performance as such, but rather to make performance a means for a richer and fuller understanding of music when appropriate. General music further was delineated as a terminal activity for the non-specialist consumer. This was consistent with the words of Dr. C. Ray Carpenter, Consultant on Films and Television, who stated "skills may be other than performances."

The pragmatic predilection which seemed to pervade the thinking of most Conference participants initially raised a barrier to realistic understanding of the potentialities of the various educational media for general music. This largely was dispelled by Dr. Philip Lewis, Consultant on Electronic Devices and Instructional Systems, who enjoined the group to think in terms of "what we need to have in the way of programed areas without regard to cost."

Utilization of materials for general music with various educational media not unexpectedly raised the dilemma of the copyright law. It was generally agreed that the definition of "fair use" contained in the current proposed revision of the U. S. Copyright Law needs to be studied further. The prevailing opinion of Conference participants to the effect that there be "unrestricted 'fair use' of copyright materials" is not shared by those who create or disseminate materials, according to Dr. Robert Slaughter, Consultant on Printed Materials. It is Dr. Slaughter's hope that some convenient, easy-to-use means can be developed whereby anyone wishing to use copyrighted materials for instructional purposes, other than through their regular purchase, may do so for a suitable consideration. In this way, users of materials would be completely free to use copyrighted materials with reasonable ease and convenience, and authors, composers, publishers, and other sources of the materials would be compensated for their use and thereby be encouraged to continue with their entrepreneurial effort.

The significance of locating and utilizing new sources of information was cogently advocated by Dr. Raymond Wyman, Consultant on Audio Devices, who reminded Conference participants that as teachers "we give away everything we have all the time." The area of educational media, it was agreed, offers exceptional opportunities for an instructor in general music to make his teaching more refreshing and novel.

Educational media, of course, do not substitute for motivation and interest on the part of a child. Reinforcement, however, is more easily obtained and more readily evident when conditions for learning are right. In discussing the psychological basis of learning, Dr. Stanley Pliskoff, Consultant on Teaching Machines and Programed

Instruction, echoed what teachers of applied music increasingly have come to accept as an axiom, namely to "start out by having a child make music can be powerfully reinforcing."

The final report of Task Force Group 5, it was agreed, should consist of the three phases which follow: Basic Principles, Specific Applications, and Recommendations.

Basic Principles

The objectives of music in general education listed in chapter 2, "Musical Outcomes," Music in General Education, published by the Music Educators National Conference in 1965, were felt to be compatible with the ideas of the group relative to General Music. These principles, quoted by permission, appropriately list the desirable musical skills, understandings, and attitudes of the generally-educated high school graduate. Musically this person: (1) listens with a purpose, (2) is articulate about music and musicians, (3) is flexible, (4) is literate concerning music notation, (5) understands the structure of the various disciplines, (6) has historical perspective, (7) integrates his knowledge, (8) is aware of the musical aspects of his environment, (9) has developed outlets for his emotions, (10) continues to grow in musical knowledge and understanding, and (11) is discriminating in taste.

Basic principles evolved from the Conference which may be applied to general music are as follows:

1. Level of abstraction must be of continuing concern in the selection and use of educational media.

Some skills, understandings, and attitudes more effectively can be taught through individualized programed instruction than in a standard classroom situation.

2. Taking into consideration their potentialities and limitations, various supplemental educational media appropriate for the learning situation can be utilized to promote active learning.

Many educational media are available which effectively may be used either for diagnostic, instructional or supplemental purposes.

3. Since one of the prime objectives of general music ought to be to educate youngsters to our cultural heritage, professionals should develop new materials for this purpose which utilize a variety of educational media.

The production of excellent documentary films such as "Music of Williamsburg" is an example. Filmed operas and teaching films similar to the Leonard Bernstein television programs would be other examples.

4. Discretion must be exercised in regard to the selection of subject matter content presented by educational media.

Some films which are developed for one audience (for instance, a large city) might not be appropriate for another.

5. Inappropriate balance between audio and visual features inhibits reinforcement of learning activities.

Since discrimination is based on reinforcements, a knowledge of each person's previous musical experience is important.

6. Musical learning, to be most effective, must be broken down into manageable items which are contextually oriented.

Packages of materials utilizing tapes, motion pictures, filmstrips, and teachers' and students' texts hold good promise for general music.

7. A competent teacher must be an expert in his field and be able to use educational media effectively in communication.

The proper training of a teacher in mass media will enable him to overcome the "danger of pathological syndrome called media fixation," according to Dr. C. Ray Carpenter.

8. Success as recognized by the learner constitutes strong reinforcement.

The complexity of musical behavior calls for emphasis on different aspects for different individuals.

9. The musical stimulus has both discriminative and reinforcing properties.

Solutions to the problem of discrimination are based on differential reinforcement.

10. Good programed instruction whould be so constructed as to aid students in avoiding errors.

Teachers, by studying programing techniques, can find ways to improve their own instruction.

11. Procedures which extinguish musical behavior should be avoided.

Aversive conditions may cause desired behavior to be extinguished because of competition from other behaviors.

Specific Applications

Basic principles, when implemented, lead to specific applications. Some of these with special significance for general music are:

1. Transparencies and tape recorders in combination can be used to give the sight and sound of musical scores.

Sound-filmstrip projectors offer good possibilities for general music.

2. Teachers can be made aware of the potentialities of new educational media (to help overcome resistance to the unknown) by demonstrations at regional, state, and district meetings.

Guide materials to accompany the media will help the teacher to identify the concepts being taught.

3. Projection of materials must take account of angle of view and the integration of picture and commentary.

Attitudes toward music may be influenced by the type of sound accompanying the picture.

4. Films may be made more appropriate for the audience by editing out unsuitable portions.

The "single-concept film" shows only the specific item under consideration.

5. In each specific instance in which educational media are to be used, adequate preparation in their manipulation must be made by the teacher.

The learner may be motivated more effectively when media are utilized in the correct manner.

6. Use film loops for repetitive instruction.

The principle of reinforcement is enhanced when items are played back immediately.

7. A central sound system can be used effectively as closed-circuit radio.

Any room in the school may serve as a studio if extraneous noises can be eliminated.

8. Tape may be used to improve individual and group learning.

A uni-directional microphone may be used on a tape recorder for simultaneous speaking and playing.

Recommendations

Basic principles and specific applications frequently are implemented only when they appear in the form of recommendations. Those which seem most significant for general music are:

1. Arrangements need to be worked out which will lead to a more ready and convenient use of copyright materials for educational purposes.

2. Producers of educational instructional materials should be encouraged to make them available for general music activities.

3. Filmstrips, transparencies, and other suitable visual aids need to be produced to accompany the basal series.

4. Professional music organizations should take action to encourage greater utilization of suitable programed learning in the home.

5. Attention should be focused on the need for more published materials of a qualitative nature and for the development of packaged materials for general music.

6. Earphones and individually geared materials need to be used to more effectively individualize instruction.

7. Technical assistants should be available at all times to service equipment.

8. Present curricula should be modified and revised when needed to incorporate effective use of new educational media.

9. New educational media need to be continually evaluated to establish their effectiveness in teaching.

10. Wider dissemination should be given to the general educational implications of operant behavior principles.

11. All educational media in the school should be made available to all teachers who are qualified and wish to use them.

12. Wiring, conduits, and educational media of quality appropriate to musical uses need to be included in the structure of the facilities to be used.

13. School performing groups need to be given an opportunity to perform over the central communications system providing the speakers are of sufficient quality to justify this use.

14. A list of music media experts who could serve as a pool for regional and state clinics and workshops needs to be compiled and disseminated.

15. Federal support needs to be solicited for the purchase of new media equipment in music as currently is being done in the natural sciences and foreign language areas.

16. More attention needs to be given to the utilization of 10-watt FM radio as a teaching resource.

17. The educational media column in the Music Educators Journal should be included in every issue.

18. A national center of educational media in music should be established and information about it be given widespread dissemination.

19. A sound program of educational television for all levels of music instruction should be encouraged in every state.

20. Materials developed through projects which are subsidized by public funds should be made available for non-copyrighted use by any individuals or publishers who may wish to use them.

21. The final report of this Conference should be given the widest possible dissemination throughout the country.

4.6. Some Notes on the Reports and the Conference

The differences in length, in content, in organization, and even in conclusions, among the Task Force Group reports were to be expected out of a Conference which sought to bring music educators face-to-face with many of the forces comprising the current "revolution" in education. But the differences in length and in amount of discussion content were due also to other reasons. Much more transpired in these discussion sessions than was generally expected. As recommendations, and the like were being developed in each of the sessions, it became evident that summarizations and interpretations of the discussion content would constitute a most valuable part of the reports.

But insufficient time was allotted for report preparation purposes in the tightly-packed week. In the words of one Recorder, "even with the best of note-taking during the Conference, there was much that escaped me." (From a progress report by Dr. Madison).

Most of the discussion sessions were taped. But no transcriptions of the tapes were made during the Conference. Due to contractual limitations as well as to other considerations, transcriptions of these sessions were not made since the Conference. Hence, transcribed records, which might have helped Recorders (or an editor) to develop comprehensive reports, were not available.

The most comprehensive report is the one by Dr. Thurber Madison. He accepted the proffered tapes of his Task Force Group sessions (and the special machine to play them), and after a considerably longer period of time than originally anticipated, he managed a report which he still felt was not as complete as he would have liked it to be.

Hopefully, the tapes will be transcribed and edited, and a supplement to this report issued at a future date. Such a supplement would give added meaning to many of the findings, which are stated in too isolated a manner to convey their full import. This is readily illustrated by citing as one example, the recommendations dealing with the 10-watt FM radio station. In the discussion sessions, it was pointed out that the 10-watt FM station had an effective broadcast range of five miles; that it was relatively inexpensive; that it could be used as a closed-circuit radio network. One value of this was noted by a participant who commented, "We have a Curriculum Director who believes in the self-contained classroom and won't hire specialists. The 10-watt FM educational station would be quite helpful here."

Nevertheless, the reports, in aggregate, present a vivid picture of the content and spirit of the Conference. The recommendations and position statements are thoughtful and far-reaching in their implications.

But if the conferees found the Conference a stimulating experience, it is pleasant to report that the Consultants found their experiences with the music educators highly rewarding and stimulating as well.

Since the reports inevitably reflected the ideas and comments of the Consultants, professional courtesy demanded that the Consultants be given the opportunity to react to them and to check them against any inappropriate content (out-of-context statements and the like) with respect to their contributions. The only major changes or alterations made in the reports were those suggested by the Consultants. The reports were not materially altered by the Project Director or by any of the MENC staff.

Dr. Weiner's suggested changes (Dr. Weiner worked with Task Force Groups 1, 2, 3) were accompanied by the following comment: "These changes were made after much thought for I didn't want to alter the opinions and attitudes of the participants in any substantial way. Some of the statements made . . . however, in an attempt to summarize my comments, attitudes and point of view are inappropriate because they are out of context. I am sure they (the participants) would want their statements to accurately reflect my interactions with them." Dr. Carpenter found the reports to be "meaty outlines which listed large numbers of points, facts, principles, suggestions and recommendations . . ." Dr. Pliskoff (who worked with Task Force Groups 4, 5) found that the statements dealing with behavioral control tended toward generality. "As you know, no principle applies in all cases independently of other conditions."

This report concludes with the summary remarks made by Dr. Charles Leonhard at the final luncheon session, which seemed to reflect the feelings and attitudes of many of the conferees:

Dr. Leonhard: We have experienced the soft sell and the hard sell, seen software and hardware; we've been patted on the head and knocked on the head.

After years of indoctrination in Field theory, when "mechanistic" has been a dirty word, the emphasis on Skinnerian psychology has been stimulating, revealing, and, to some, shocking.

We have been pleased, in the Theory Task Force Group, to find that much of the current research in musical learning and most of the available programs are in the theory area.

The Conference has brought forcefully to our attention the following:

1. The possibilities of a learning-teaching technology being developed and applied to music teaching.

2. The possibilities for greater emphasis on individual learning in music.

3. The possibilities for using operant behavior theory for analysis of learning processes and teaching procedures in music.

4. The need for specifying behaviors which constitute some of our vaguer concepts such as "appreciation."

5. The need for more precise analysis and description of the musical behaviors we wish to teach.

6. The need for more precise determination of desirable sequence in musical learning.

7. Some of the present limitations of operant behavior theory in illuminating the music learning process.

8. The need to substantiate the importance and relevance of some of our concepts.

9. The need to differentiate between learning and the consequences of learning and to relate one type of result to the other.

10. The need to place constant emphasis on the media of instruction as means which require us to be a good deal more precise about our objectives than we previously have been.

11. The need for greater cooperation and interaction among systems specialists, media specialists, research specialists and music teachers.

We have been inspired to make greater use of common audio and visual media.

We have been challenged, intrigued, and a little frightened by peeks into the future.

Possible reactions for Conference participants:

1. Go all the way in programing instruction and not bother with objectives and learnings that cannot be analyzed and programed with the current state of operant behavior theory and technology.

2. Decide that none of what we have seen applies to us and go our way as before.

3. Get to work seriously defining our objectives precisely, specifying the behaviors we want to teach and selecting the technology and the media that can best serve as means to learning those behaviors.

5. SOME NOTES ON DIVERSE THEMES

5.1. The Panel Discussion

As the Task Force Groups progressed from one media category to another, it soon became apparent that as new vistas were indeed opening up, a number of common themes as well as one "uncommon" theme were developing.

Among the common themes were: the need to determine the goal of learning in every case before consideration is given to any media; the need to support the use of media with sound educational and psychological theory; the need for new directions in research, and for the establishment of material development centers, and so on.

The "uncommon" theme developed out of the demands of programed instruction for externalizing the goals of musical instruction and learning in terms of explicit observable behavior. Although this view intrigued, interested and stimulated, it also generated considerable "shock." Was programed instruction (and its supporting theory) compatible with the goals of music education? Admittedly, many participants saw some immediate applications, as in learning musical fundamentals, and in drill work. But what about the aesthetic and artistic values inherent in music? This theme developed quite rapidly in the Conference and reached a climax during the Tuesday evening Panel Discussion session.

Dr. Choate, the Panel Moderator, noted that from the number of questions turned in dealing with the problem of the aesthetic values in music and the new educational technology, it was quite evident that here was an area of deep concern among the conferees. He then read the following question which was addressed to Dr. Weiner: "Will the assessed values of music suffer in programed instruction?" Because the problem is an important one for music education as well as for psychology, the treatment it was given at this session is reported in some detail.

Dr. Weiner: I think you are referring to the problem of aesthetics and operant conditioning technology. I am not quite sure of the response I should make. I think the best answer is that I don't know for sure. I assume, in the absence of knowing either way, that there may be such a thing as, for example, an aesthetic feeling. Aesthetic feeling may, to some extent, involve internal responses which occur as a consequence of a wide variety of events in present and past environments. The non-public or physiological nature of these responses may be why aesthetic feelings are difficult to define and investigate. Future advances in physiological techniques may make it possible to define and measure the physiological patterns that are associated with aesthetic experiences.

I might suggest, however, that already established principles of reinforcement may be operative in the development and maintenance of aesthetic feelings. For example, when you say "it is beautiful," you may be reinforced when someone agrees with you. Such agreements may increase the likelihood that both your verbal statement of an aesthetic feeling and its associated physiological activity may occur again.

There is room in the analysis of behavior for such things as aesthetic feelings because there is room in the analysis of behavior for private internal events which have the potentiality for observation, prediction and control. While it is true, in general, that operant conditioners prefer to examine overt rather than covert events, I think this is primarily an experimental strategy. It is simply easier for us to examine the properties of overt events. It is for this reason, in part, that we have avoided the "black box." However, we know that it's there. I think that there is reason to believe that in the near future we will come to grips, slowly and in small steps, with the problem of subjective feelings and the black box. We have already made a considerable start in this direction.

Could some of you summarize for me the nature of your concern about aesthetic feelings?

Dr. Lewis: I think that many of us feel deeply disturbed by the total theoretical position that does not seem to take aesthetics into account because we believe that aesthetics are important to people. We get little satisfaction when the reality of aesthetics is questioned. Although we realize the difficulty in defining aesthetics, I think that we are looking for help to try to delineate this concept so that we can work more effectively in this area.

There are things that you can point to as indices of aesthetic experiences. Why do we have museums? Why do people go to museums? There is no profit motive. What is the reinforcement?

Dr. Weiner: To present my point of view here, I will have to go into a bit of philosophy. There are several basic tenets that most operant conditioners accept as valid. The first of these goes something like this: if something exists, it exists in quantity, and it is determined by determinants that are determinable. A second tenet is as follows: all of our knowledge of things that exist is inferred from occurrences of observable events, i.e., motor, verbal, or physiological behaviors.

These tenets provide a useful strategy for going about the everyday business of behavioral science. However, it can be extremely dangerous if we say, "what is currently not observable does not exist." We must have faith that things now unobservable may be made observable. The history of science has shown that it is wise to have such faith. If we simply assume that things that are not observable at present do not exist, we may not perhaps strive to develop techniques to make them observable for measurement and analysis.

In my own opinion, it is not unreasonable to assume that there is something "real" associated with an aesthetic feeling. It is quite true that at present we cannot make this something readily observable. I believe that, if we are interested in this phenomena, we, as scientists, must search for ways to make it observable. If we try, we may succeed. If we do not believe that it exists, we may not try. It is not inappropriate for an operant conditioner to ask, "I wonder if there are physiological responses which are related to the subjective experience that we have when we say we have an aesthetic feeling."

Dr. Lewis: May I ask just one question along this same line? Are we certain that this operant behavior is not actually having an internal effect or effects about which you know nothing at all? If this is true, then it ties in with an aesthetic experience which we still can't define. All we are dealing with overtly are symptoms rather than the basic causes of an aesthetic feeling.

Dr. Weiner: The first part of what you said is in line with what I've been saying. Your statement concerning "symptoms rather than basic causes" should be questioned. I don't think that any subjective experience exists in a vacuum. "Nurture and nature" exist together in space and time. What is symptom and what is basic cause is an empirical question that can be determined only by the extent to which different factors predict and control some criterion event or phenomenon or interest.

Dr. Lewis: This is part of what I think is disturbing us. Aesthetics do happen "inside" and "outside" at the same time, but the "inside" aspects of aesthetics are still a mystery so we can't rule out the existence of aesthetics.

Dr. Weiner: I agree. However, I would like to say that operant conditioners are beginning to examine what is going on inside. We've been able to show various kinds of physiological concomitants that go along with all kinds of overt behavioral and verbal responses.

Dr. Lewis: Psychosomatic things, right? They are body processes which result from something that happened on the outside.

Dr. Weiner: In this sense, everything is psychosomatic.

Dr. Lewis: All right. But now, let's go a step further than that. Isn't it possible that our thinking and attitudes are not just based on our overt behavior? Isn't it possible that these things are influenced differently by other processes of which we are not aware at all?

Dr. Weiner: Yes, of course.

Dr. Lewis: Then can't we hang on to a little bit of aesthetics...

Dr. Weiner: This is what I am suggesting that you do.

Dr. Lewis: I know you are, but...

Dr. Weiner: I suggest that interested scientists should be concerned about aesthetics. That it is our job to take your feelings and our own feelings seriously enough to attempt to find ways of verifying and examining as yet unknown phenomena.

Dr. Lewis: I am with you.

Dr. Weiner: I think that I am with you too.

Dr. Choate: I wonder if we could focus more on the positive aspects of the learning film /"Learning and Behavior (The Teaching Machine)"_7, the work we saw at the Institute for Behavioral Research, and the implications of this for actual teaching, relative to content in music, content and procedures. Do you have comments on this?

Dr. Weiner: I agree with Dr. Choate here. Although, it is true that we have more questions than we have answers, we do have some principles and some observations that we've made which may be of use. The only way we can improve our procedures and principles is by you, and others, telling us the problems and complexities you face.

Someone in the audience: Most of your operant principles come from the laboratory rather than real life situations. Aren't they oversimplified?

Dr. Weiner: I don't think we should worry so much about the simplification of things in the laboratory. Lots of people feel that when we approach a complex problem by rigorous experimental analysis, we destroy the phenomena we are examining. The history of science has shown that this is not true. Analysis, that is, breaking down, simplifying, controlling under laboratory conditions, and then trying to build back up, has been shown to be a useful method of dealing with a complex problem. Dr. Skinner has pointed out, for example, that we cannot effectively analyze the cooling curve of coffee at "breakfast table conditions." In order to do this, we must take the coffee into the lab, examine the cooling process under controlled conditions, and make generalizations from the process we've seen in the lab to "breakfast table conditions."

Why do we keep doing laboratory analyses? Because we are reinforced by success. It seems to work. It seems to have practical utility.

I think that there is a great deal to gain from an experimental analysis of musical behavior. I think most of you pretty much feel this way. I don't have to oversell this idea. We, at present, don't have all-purpose universal laws to give you for use without your thinking about its effective utilization. But if you will be satisfied with incomplete knowledge, which is all that science can ever provide, then I think that the principles of operant conditioning have a lot to offer.

As music educators, you may be facing the kind of problem a man faces when he finds himself in a harem for the first time. You all know what you would like to do, you just don't know where to start. Perhaps the experimental analysis of behavior can help you here. You will see a beginning of this in Dr. Maltzman's film.

You are the consumers of our knowledge, whether it is media, learning principles, or whatever. The best way that we can improve our knowledge is to communicate to you the limitations of our knowledge as well as the positive things that we know. If, however, you are looking for a magical device that you can plug in, and have all your problems solved, I don't think any of us have it. You must do the job of telling us what musical behaviors you want and under what conditions you want them. I think that if you can think about this, tell us a little bit more, work with us on this, we can then perhaps, together, understand musicality by bringing to bear some of the principles of conditioning and learning which seem to have great generality and utility.

Dr. Choate: Thank you, Dr. Weiner. That was very, very good. All of the questions that you just got through asking of them, were asked of you on these cards, believe it or not! So I think we're very much in agreement as to the questions which should be asked at this time. And the group has evidently thought these through very well, and I hope we can proceed with it. Dr. Carpenter, you have some comments?

Dr. Carpenter: I have one question which poses a work problem for you. And then a suggestion. The question is: what really should we put together by way of instruction from the general field of psychology which would be useful for music educators? You are not unfamiliar with the fact that there exists a field of psychology. And you are probably not unfamiliar with the fact that operant conditioning and the Skinnerian approach is only one approach and one set of techniques especially designed to investigate certain kinds of behavior. And what I am referring to now is a much broader perspective on the field of psychology. I have been in this field for more than 30 years trying to keep up-to-date in it. I've spent a great deal of time with pigeons and non-human primates and humans, and we must, I think, recognize that the operant conditioning approach is not all of the field of psychology, either in breadth or in history or in depth. There is a tremendous field of physiological psychology, of sensory psychology, of aesthetic psychology, which I think may have something of value for music education. What I am suggesting is that there would be a great

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number of people in the educational and psychological fields who would be curious to know what your requirements are, what you would ask of them. I think, in a sense, that I have included my suggestion. I feel that I would be professionally irresponsible if I didn't point out to you that there is much more in the field of psychology that we ought to consider than what is being presented from the operant conditioning point of view at this particular Conference.

Classical conditioning is certainly a very basic and fundamental thing that could be studied and out of this grew operant conditioning. You can't, therefore, deny the history of this. There is a tremendous field of neurophysiology and sensory psychology that is related. I could point to distinguished scholars at Harvard such as Cannon and James and others who have made important contributions to the field of the emotions, basic processes underlying feelings and emotions. And this ought to be brought into the picture. My suggestion here, furthermore, is that just as we talk about systems of media and accept those media which are appropriate to doing our particular job, so also we should consider various points of view, concepts and principles, and select those that are appropriate to the doing of the performance of our job. Thank you, Mr. Chairman.

Dr. Maltzman: I had a strange suspicion that this problem would come up, the problem of behavioral as opposed to other fields of psychology. I don't know when I have seen it handled better. I think that we have heard a great deal of wisdom in Dr. Weiner's approach here tonight. He asked us to take him as he is, not with any myth or magic or anything else. Furthermore, he extended his hand to us in cooperation, concern and friendship. I thank Dr. Carpenter for his remarks and for reminding us that this world is a rich world and that the problem we're discussing is of concern to many fields. Nobody has cornered the market on learning. There is no question but that we have to follow every lead.

There is a private world that we all know about. I'm sure that we do not have to observe our pulses, or the temperature of our blood, or the white count of our corpuscles to know when we've got a toothache. There are private things that we must accept from experiences common to all of us.

Dr. Choate: I felt that our discussion over these past two days made us all think very critically and this is very important. It is no good for us to come here and pat ourselves on the back and continue platitudes about what we think and feel. So this has been very helpful and stimulating.

I'd like to close by saying that we are in your debt, gentlemen, for your remarks tonight. We like the thoughts you've given to us. There is a story that a boy once twisted the tail of a donkey. His face didn't look so pretty after that, but he was certainly a lot smarter. It may be that that is the way we feel tonight. I'm sure that we will have inquiring minds as we go into the next few days of the Conference.

5.2. A Conference Highlight

Traditional goals and values of music include creativity, expressive fulfillment, and preparation for leisure. Not only are the consequences of such global goals greatly delayed, as Dr. Madison noted in his report, but rarely, if ever, are the goals themselves subjected to very stringent evaluation.

The film, "Of Time, Work and Leisure," poignantly highlights man's unpreparedness to deal effectively with his growing leisure time. It was selected to provide a focal point for a consideration of creativity in the educative process. The talk by Stanley Foster Reed in this session was one of the highlights of the Conference. Many of the delegates requested that it be reproduced in its entirety.

Mr. Reed: First, let me congratulate you on the efficiency with which this meeting is being conducted. You have made an excellent start. You have solved some sticky procedural problems that confound the most sophisticated conference planners. I am impressed. The Conference is exciting.

Thirteen years ago I built some teaching machines. I had no real idea of the behavioral problems involved. We were simply attempting to teach foreign languages better and faster. In selling them, I learned the administrative problems that you educators face when you are presented with new pedagogical tools such as those you have seen here. You have my sympathy! But you have even larger problems to face. One of them is this: faced with a world in which great lumps of leisure time will be available, how are we to educate to use it productively? In the film you are about to see, "Of Time, Work and Leisure," this question is asked of society in general. I ask it of you in particular.

While you watch the film, I request that you bear in mind that most of us here at this Conference grew up dominated by the Protestant ethic of hard work. Work was, in itself, the greatest of virtues. Idleness was the work of the devil! We were told in early childhood to do things, lots of things and to do them fast. Now, suddenly, we, the end products of this process are told that the machine will take over. We are asked to relax. Who can?

You must ask yourselves if our educative philosophy and the methods that depend from it are proper instruments to condition our citizens for a happy life in a leisure society. You must ask yourselves if the concentration on rote-learning practices that so dominate today's pedagogy is not inconsistent with the creative arts. You must ask yourselves, is not origination, in the leisure age to be, of far more importance than performance?

I may be a poor person to talk about leisure since I have never had any. Perhaps, you are a poor audience because you have never had any either. Who in the teaching profession has? For that matter, I don't know if either of us wants any. But as educators, you must concern yourselves with it.

As you watch this film, notice that the commentator asks, in effect, this question--"what happened to the good life? The machine was supposed to make life beautiful and good and instead we seem to be getting more and more frustrated. Why?"

I think I know why.

We are educated by methods that are basically replicative rather than generative. Status is gained in the educative process by repetition of facts not by creation of new ones. Thus, we have created a society that finds its greatest pleasure in passive enjoyment, looking at picture plays, reading books, looking at art, watching ball games, etc.; and any creative drives are confined to building an economic base. But if man is truly homo faber, he wants to build continuously and when you take away his economic base (his job), he is lost.

The product of such a system buys replicas of paintings by the famous rather than originals by the unknown. And what else can you expect from the product of an educative process that has conditioned him to zombie-like repetition of meaningless symbols and unrelated facts. You must create a desire for individualistic expression, if you want to destroy the machine that is threatening to turn us into footless creatures. The machine can exist only by satisfying a mass taste. It can be defeated only by creating unique taste. How can you help to bring this about?

Your basic problem is the development of creative and expressive drives in the student. How do you teach that an imperfect rendition of an original composition is infinitely more important than a perfect rendition of a classical commonality?

First you must believe it yourself!

FILM

It seems odd to me, that in a discussion of leisure, that there is no mention of music which through the ages has been one of the hallmarks of the leisure, "cultured" society.

As educators, I believe that you should understand the relationship of the creative process to the enjoyment of leisure.

Since you are responsible, in large measure, for the future well-being of great masses of people, and since musical education is potentially one of the most useful of the arts to add pleasure and expressive fulfillment to the leisure society, you must understand that the rote-learning process that forms the basis for most teaching in the U. S. is basically antithetic to the concept of the enjoyment of leisure.

The important thing to remember about the creative process is this: it is composed of two parts: the creative act or thought or deed and the societal reaction thereto. It is important to understand that appreciation is heightened if one engages in creative activity oneself. A society that admires the creative act for its own sake is more appreciative of the creative act in others. Thus again, may the machine-fed forces of mass taste creation (usually at a very low level of intellectual activity) be defeated. I cannot believe in mass appreciation that is not based on knowledge of or a feeling of admiration for the creative act. An appreciation spectrum that has as its base rote-acquired knowledge can only result in preference for repetitive trivia over the truly excellent.

Can't we teach that human beings, unlike the lower animals, in large measure, create their own environment; that it is very human to create? The child who pleads "please, Mommy, think of something for me to do" is striving for guidance in the originating process.

Opposed to this is an educative philosophy wherein children are led to believe that the acquisition of knowledge per se, that is, knowledge of large numbers of facts (learned in vaccua without regard, in many cases, to any potential application) is more important than originality. The educative process whould begin by instilling in the student the idea to create not to replicate and to create even without excellence. They should learn that excellence comes later and is generally a matter of technique.

Teaching this requires an understanding of the mechanics of the creative act. The mathematics are very interesting. Given objects, such as musical notes, as the creative material, we find that the creative potential can be computed! We simply multiply each variable by the product of the previous variables, thus one x two is two, x three is six, x four is twenty-four, x five is one hundred twenty, and so on. By the time you get to x 8, the number is 40,320. In other words, there are 40,320 permutations (tunes) that can be played on an eight note instrument without introducing any of the possible musical variations. With a forty note instrument, and by adding ten musical variations, such as rests and other holding periods, we find that there are more simple tunes possible than there are particles in the known universe! This is why I disagree with my friend, Bucky Fuller, who doesn't like the word "creativity" since he seems to feel that all these things were always there "waiting to be discovered." In the kind of creative process I am talking about, the universe of possibilities is so great that the chance of anyone else ever matching the creation is infinitely small; therefore, it is true creation--not something "waiting to be discovered."

Do you remember the story "Inflexible Logic" by Russell Maloney about the six monkeys that were set down at typewriters and started to type up all the books in the British Museum? It is interesting that the writer chose to build his story about a replicative theme rather than a generative theme. Why did he not have them produce a new poem of surpassing beauty rather than have them make a perfect replication of something that has gone before?

While the story is humorous, it leads the reader to believe that by some chance, remote to be sure, intelligent communication can be created; that it is in a word, finite. This is simply not so. If all the monkeys in the world were set down at all the typewriters in the world and started typing, in a thousand years they wouldn't type up more than two or three words in succession that held any meaning for humanity, much less a perfect replication of something that had gone before. There is a universe of universes, an infinity of infinities of new combinations of words, of new fusions of colors and of new successions of musical notes to be created.

Now the mathematics of generation, once grasped, are important to transmit to others. If we can instill in the student the concept that of a universe of untried possibilities not only in art but in literature and engineering and in all other fields of human endeavor, if we can insert in the mind of the student the confidence that he can create and thus control in some large measure his own environment, if we can make him think and reach and thus become himself, a unique human being, if we can do all this, he will find his own way to the rote room to gorge himself on the knowledge of "that which has been" in order to carry his creative project to a higher point. He will learn the techniques of communication in order to tell others, and to collaborate with others in creating ever newer and more beautiful things. And let us not forget that a creative person can consciously vary the rote-learning process in such a way as to make his learning more efficient--thus making the rote-learning process an integral but still a *dependent* part of the creative process.

These concepts are not easily grasped by the stewards of our educative institutions having been heavily conditioned by rote processes. That it is not grasped in the most important school of them all, the home, is evidenced by a common experience.

A child comes home: "Mommy, six times six is thirty-six."

His mother shouts for joy and gives him a hug and a cooky.

The child has no idea how to use this little bit of knowledge except to optimize the production of hugs and cookies. The next moment giving in to an impulse to do something creative (*homo faber*, if you will), he draws a little picture on the wall. This time he gets a *hit*, not a pat on the head plus a lecture about how bad he is and a series of negative reinforcements whose end result is the creating of another little examination cheater or another little TV watcher. And speaking of TV, remember all those people who sold their souls to recite rote-acquired knowledge? They were the cream of our intellectual society. Is it not significant that they lied to juries of their peers? It is not only important that *they* thought it was good to recite factual trivia in return for cash and kudos, but that 60 million people in the TV audience thought "Here is excellence!" This is the kind of national ethic that is being generated out of the educative process. It is bad and it is wrong.

In the film you will remember the old fellow, retired from his job and sitting on a park bench with another 10 or 15 years of existence staring him in the face. Now you know why he sits with his head down. Can you see him looking up and saying, "Please, Mommy, think of something for me to do!"

Perhaps the mass solution can only be found in the arts, since the evidences of potential for varibility are more readily at hand in a paint-pot or a keyboard than they are in permutations of numbers of the discovery of the interaction mechanisms of hordes of subatomic particles. Like learning Latin (which I am told helps the learning process per se in addition to providing a philological base for learning other languages), learning and being successful at the creative process in one discipline may serve the greater purpose of making one creative in another.

In your own field, I recommend to you that there are many applications for the creative spirit. For instance, there on the platform are some 30 different pieces of audio-visual equipment that have a variety of uses. There is no mechanical reason for you to duplicate the array or operating sequence of this setup. Each classroom can be unique in its design and unique in its pedagogy--a pedagogy designed for the learning needs of a particular group or the instructor's particular teaching bent. There may be other reasons for standard arrays but they are not mechanical. They are administrative and, rarely, as of today, pedagogical.

There is no mechanical reason why each of you should not compose 200 good pieces of music, each of them completely original and quite unlike all the others. Habits of thought and patterns of behavior will, of course, negate this possibility, but mechanically or mathematically there is no bar to such happenings. Concentration on that tiny bit of recorded knowledge considered excellent because it was winnowed out of a great mass of composition, it would seem, has left very little to be done. The larding of "classical" covers the fat of fear of individual expressionism.

I sometimes think the human race would be better off if it took 98% of all the world's recorded information and destroyed it--burned nearly every book, nearly every composition, every recorded thing in every form and started out anew. I believe that in 25 years the human race would not only have survived beautifully but that it would be ahead of the game in total knowledge and it would be a far more accurate knowledge and perhaps a far more beautiful knowledge.

With an infinity of poetry yet to be written, who says that Shakespeare will live a thousand years from now? The great renascent societies of our time are those that were rebuilt after being destroyed. Look at Germany after WWII. Chicago, 80% destroyed by fire, rebuilt completely and a few years later withstood financial crises that panicked the older cities. Culture, a biological phenomenon, is the better for the test of forced survival.

It is unfortunate that with an infinitude of potential creation, worship of that minuscule bit of already recorded knowledge, locks us into unproductive patterns of thought and action when one could bring new life to the educative process with a whole galaxy of new music, new literature and new plastic beauty. Yet, this is the ethic we pass on. We create a soulful worship of cant and bottle up and contain the creative drive that is, in fact, the human spirit. This is the ethic we have generated. I think it is wrong. I would like to see us change. I believe that the music educators of America can play a key role in the process of change. I hope that upon reflection you will agree with me.

Thank you.

6. EVALUATION SUMMARY

As was noted in the Introduction, certain aspects of the Conference were evaluated for the benefit of the Conference planners. Following are some of the evaluation items which may be of general interest. Conferees were asked to answer questions using this 5-point scale:

5 - Exceptionally good
4 - Above average
3 - Average
2 - Below average
1 - Exceptionally bad

Example: If you feel that a particular aspect of the Conference is "below average," place 2 in appropriate space. If another aspect of the Conference is "exceptionally good," place 5 in the appropriate space.

Item: Compared to other conferences I have attended, I would say this Conference was:

Rating Scale	Task Force Group # 1	2	3	4	5	Total
5	12	12	12	7	9	52
4	3	3	4	-	5	22
3	-	-	-	2	1	3
2	-	-	-	-	-	-
1	-	-	-	-	-	-
No answer	-	1	-	-	-	1

Item: The planning of this Conference was:

Rating Scale	Task Force Group # 1	2	3	4	5	Total
5	4	12	5	1	8	30
4	11	3	11	10	6	41
3	-	-	-	4	1	5
2	-	-	-	1	-	1
1	-	-	-	-	-	-
No answer	-	1	-	-	-	1

Item: As a professional experience, I found it to be:

Rating Scale	Task Force Group # 1	2	3	4	5	Total
5	12	12	13	10	13	60
4	2	3	3	3	1	12
3	-	-	-	3	1	4
2	-	-	-	-	-	-
1	-	-	-	-	-	-
No answer	1	1	-	-	-	2

Item: The daily schedules were:

Re-	Task Force Group #					
sponse	1	2	3	4	5	Total
Too long	2	7	7	9	5	30
About right	13	8	9	7	10	47
Too short	-	-	-	-	-	-
No answer	-	1	-	-	-	1

Item: The overall value of the position papers to this Conference was:

(N = 390 -- one response per participant for each of the 5 papers)

Rating	Task Force Group #					
Scale	1	2	3	4	5	Total
5	28	45	29	29	35	165
4	38	22	41	37	31	169
3	9	12	9	11	9	50
2	-	1	-	4	-	5
1	-	-	-	-	-	-
No answer	-	-	1	-	-	1

Item: Each Consultant's contribution within the Task Force Group was:

(N = 390 -- one response per participant for each of the 5 Consultants)

Rating Scale	Task Force Group # 1	2	3	4	5	Total
5	35	52	47	39	41	214
4	35	21	27	26	21	132
3	5	4	6	12	12	39
2	-	-	-	2	1	3
1	-	-	-	-	-	-
No answer	-	1	-	1	-	2

Item: The value in viewing the following films for a better understanding of educational media in general was: (Rate each)

Teaching Fundamentals of Music (Spohn):

Rating Scale	Task Force Group # 1	2	3	4	5	Total
5	5	6	8	1	4	24
4	8	7	8	7	10	40
3	2	3	-	7	1	13
2	-	-	-	-	-	-
1	-	-	-	-	-	-
No answer	-	-	-	1	-	1

Item: **The value in viewing the following films for a better understanding of educational media in general was: (Rate each) (Continued)**

Analysis of Musical Behavior (Maltzman):

Rating Scale	Task Force Group #					Total
	1	2	3	4	5	
5	4	9	7	2	4	26
4	8	4	7	9	8	36
3	3	2	2	4	3	14
2	-	-	-	-	-	-
1	-	-	-	-	-	-
No answer	-	1	-	1	-	2

Aural Perception Training (Carlsen):

Rating Scale	Task Force Group #					Total
	1	2	3	4	5	
5	6	10	6	2	4	28
4	7	4	4	7	9	31
3	2	2	5	5	2	16
2	-	-	-	1	-	1
1	-	-	-	-	-	-
No answer	-	-	1	1	-	2

Item: The value in viewing the following films for a better understanding of educational media in general was: (Rate each) (Continued)

Automated Rhythm Training (Ihrke):

Rating Scale	Task Force Group #					Total
	1	2	3	4	5	
5	4	7	3	1	3	18
4	5	2	5	4	8	24
3	5	6	5	8	3	27
2	1	1	2	2	1	7
1	-	-	-	-	-	-
No answer	-	-	1	1	-	2

Item: The value in viewing the following films for a better understanding of media usage in music instruction was: (Rate each)

Teaching Fundamentals of Music (Spohn):

Rating Scale	Task Force Group #					Total
	1	2	3	4	5	
5	8	10	8	8	10	44
4	6	3	7	5	4	25
3	1	3	1	-	1	6
2	-	-	-	-	-	-
1	-	-	-	-	-	-
No answer	-	-	-	3	-	3

Item: The value in viewing the following films for a better understanding of media usage in music instruction was: (Rate each) (Continued)

Analysis of Musical Behavior (Maltzman):

Rating Scale	Task Force Group # 1	2	3	4	5	Total
5	8	11	7	1	7	34
4	6	5	7	5	5	28
3	1	-	2	7	3	13
2	-	-	-	-	-	-
1	-	-	-	-	-	-
No answer	-	-	-	3	-	3

Aural Perception Training (Carlsen):

Rating Scale	Task Force Group # 1	2	3	4	5	Total
5	11	10	6	1	4	32
4	4	4	6	7	8	29
3	-	2	2	6	3	13
2	-	-	1	-	-	1
1	-	-	-	-	-	-
No answer	-	-	1	2	-	3

Item: The value in viewing the following films for a better understanding of media usage in music instruction was: (Rate each) (Continued)

Automated Rhythm Training (Ihrke):

Rating Scale	Task Force Group # 1	2	3	4	5	Total
5	7	6	3	1	5	22
4	4	5	6	4	4	23
3	3	4	4	8	6	25
2	1	1	2	1	-	5
1	-	-	-	-	-	-
No answer	-	-	-	2	-	2

Item: Circle the number next to each piece of equipment that is made available for your use.

Motion Picture Projector	76	Television Receiver	39
Filmstrip Projector	76	Overhead Projector	62
Record Player	75	Radio	59
Tape Recorder	76	Slide Projector	66
Opaque Projector	59	Teaching Machine	11

Other 13

Item: Circle the number next to each type of material that is made available for your use.

Films	73	Maps	25
Filmstrips	73	Flat Pictures	47
Recordings (disc)	75	Slides	57
Tapes (audio)	69	Posters	44
Models	26	Programed Instruction Materials	14
Charts	46	Transparencies (overhead proj.)	48

Other 4

Item: How would you rate your use of each of the following media in your teaching practice?

Rating Scale	Films	Film-strips	Programed Materials	Trans-parencies	Tapes	Flat Pix
5	12	15	7	17	31	9
4	28	26	15	15	24	16
3	25	18	15	13	17	24
2	8	12	21	12	2	9
1	2	2	6	10	-	7
No answer	3	5	14	11	4	13

Item: How would you rate your use of each of the following media in your teaching practice? (Continued)

Rating Scale	Recordings	Slides	Maps	Models	Charts	Posters
5	42	11	3	4	13	7
4	25	20	6	9	14	20
3	7	17	17	27	28	27
2	1	14	20	16	11	10
1	-	6	12	9	1	4
No answer	3	10	20	13	11	10

Item: Rate yourself in the effectiveness of your use of media and materials.

Very effective:	7
Effective:	58
Ineffective:	11
No answer:	2

Item: How do you use the above materials in music instruction? As a tool: (Check one)

To supplement instruction:	22
For direct instruction:	1
In combination:	54
No answer:	1

7. EPILOGUE

It is, of course, much too early at this writing to assess the ultimate effects of the Conference.

Reports and bulletins on the Conference were made by many of the delegates in their state music education periodicals. Post-Conference bulletins were carried in the Music Educators Journal and in the Journal of Research in Music Education, two national publications of the MENC. Both the Julliard Project and the Media Conference were reported in an article in the New York Times of January 13, 1965, under the heading, "New Ways Sought to Foster Music Appreciation and Artistry."

Follow-up reports on the Conference have been given at all of the regional and state music education association meetings held to date, among them, the MENC Southwestern Division and Oklahoma Music Educators Association (February 27 - March 2, 1965); the MENC Northwest Division in cooperation with the Oregon Music Educators Association (March 31 - April 3, 1965); the Washington, D. C. Music Educators Association (February 18, 1965); the Massachusetts Music Educators Association (April 8 - 11, 1965); the Eastern Division of the MENC (February 4 - 8, 1965); and the MENC Southern Division (March 11 - 13, 1965).

Requests for viewing and for purchasing the Music Research Film made for the Conference ("Self-Teaching of Music Fundamentals" Dr. Charles Spohn, Ohio State University; "Analysis of Musical Behavior" Dr. Edward Maltzman, Harvard University) have come from many parts of the country. It is interesting that these requests have come from university departments of education and psychology, as well as from the field of music, including the Contemporary Music Project's Comprehensive Musicianship Seminar, at Northwestern University, April 22 - 25, 1965, sponsored by the Ford Foundation.

Numerous requests were received for copies of the positional papers (similarly from audio-visual, education and psychology as well as music departments). Recently the Kentucky Department of Education, Division of Instructional Services, published and distributed the Goldiamond-Pliskoff paper as a special circular (No. IS-42-110). In his introduction to the paper, W. M. McQueen, Supervisor of Music Education, included this significant note: "In part, this type of psychology is a way of organizing and presenting an educational experience which should have merit in a general way. The requirement of an observable response, without denying certain mental processes, does prove or disprove that learning has taken place."

It is hoped that other, much more important outcomes will be forthcoming with the publication of this report. These, of course, will be the research, content analysis, materials development and the other types of projects undertaken to implement the findings contained in the Task Force Group reports. In the period from the end of the Conference to April 1965, some 30 music research proposals were received by the U. S. Office of Education.

It should be noted that the Conference did not have to generate interest in the new media, or in the use of new media in music education. Nor, indeed, did the Conference have to awaken the need for improvement in the music education curriculum. Throughout the planning and development of the Conference, it was evident that interest in these areas was at very high levels. The Conference brought to light numerous instances of creative exploration with new media and with new materials development in all parts of the country. If the Conference serves to encourage and expand these activities, to give them direction and purpose and to stimulate cooperative activities with other disciplines and skills, then it will have fulfilled its function.